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Popular Mechanics Magazine

6 N. Michigan Avenue, Chicago, U. S. A.

EDITED BY H. H. WINDSOR

England: The International News Co.
5 Breams Bldg., Chancery Lane, London, E. C.

Australia:
The Australasian News Co.

ISSUED MONTHLY

SUBSCRIPTION:

SINGLE COPY, 15 CENTS

In United States, and its possessions, Cuba and Mexico, per year, postpaid	\$1.50
To Canada	1.75
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All subscriptions are discontinued at expiration. Please examine the date printed on your wrapper.

Entered as Second Class Matter Sept. 15, 1903, at the Post Office at Chicago, Illinois, under Act of March 3d, 1879.

Entered as Second Class Matter at the Post Office Department, Canada.

Published monthly by POPULAR MECHANICS CO.

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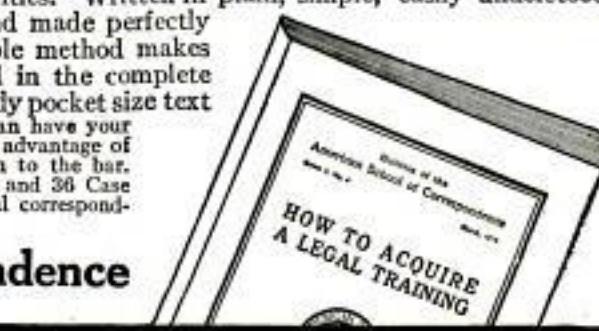
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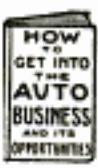
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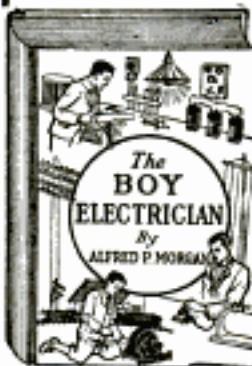
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How to develop Reasoning Power.
How to handle the mind in Creative Thinking.
The secret of Building Mind Power.
How the Will is made to act.
How to test your Will.
How Strong Will is Master of Body.
What creates Human Power.
The Six Principles of Will Training.
Definite Methods for developing Will.
The NINETY-NINE METHODS for using Will-Power in the Conduct of Life.
Seven Principles of drill in Mental, Physical, Personal Power.
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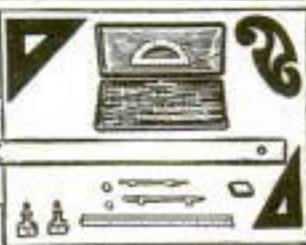
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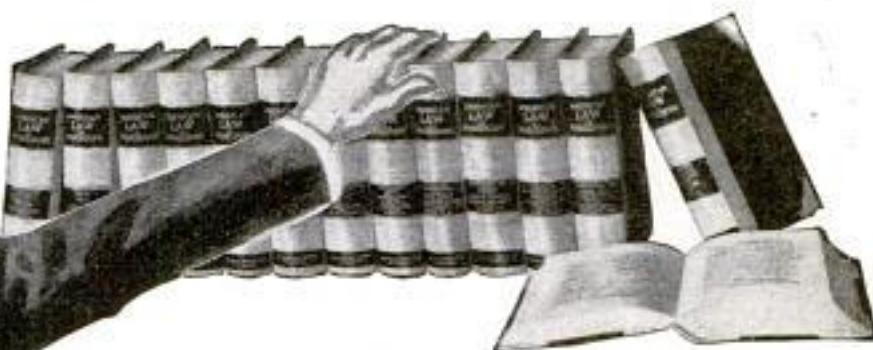
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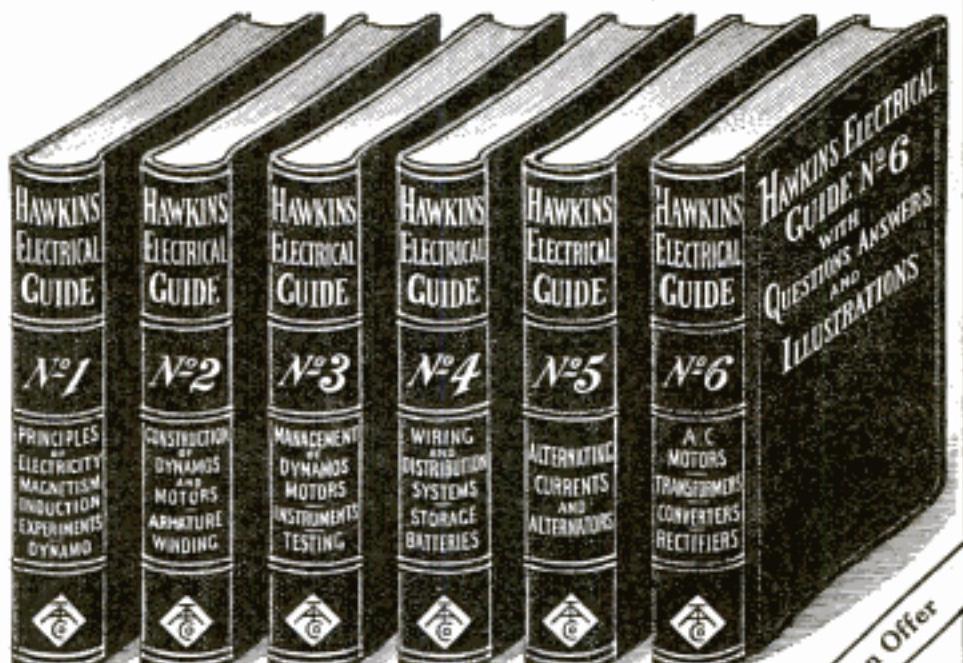
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FOR Sale, 4A kodak, Tessar lens, Volute shutter, rack and pinion for focusing. Complete outfit cost \$131. Perfect condition, little used, \$85 cash. Dr. Jay Tuttle, Astoria, Ore.

ENLARGEMENTS, 8x10, 25c; 16x20, 55c; films developed free; prints of same 4c. De Vitto Co., New Dorp, N. Y.

IVORY Finish Prints. Something new and beautiful. Send your pet film and 4c for sample, together with our free developing coupon, United Publishing Co., 2 Sherman Place, Jersey City, N. J.

TRY us. Roll Film Developed Free. Write "Ensign," Omaha, Neb.

YOUR film receives the personal attention of an expert. Best results, quick returns. Booklet with sample prints and enlargement free. H. Cobb Shaw, 118 Bowdoin St., Boston.

OUR Autotake operates any camera automatically, permitting you to be in all pictures and allows any range of time for posing. Guaranteed. Give model of camera. Price prepaid, \$1 or send for literature. The Autotake Company, M-263, Chicago, Ill.

50c TRIAL offer for 10c. Send one roll of film, any size, 6 or 12 exposure (or film pack); we will develop film or pack and make a total of 6 pictures from best negatives for 10c (stamps). Beautiful 10-inch mounted enlargements, 25c. Price list and sample print free upon request. Roanoke Cycle Company, Roanoke, Va.

ANY film developed, 5c. Prints 2 $\frac{1}{2}$ x3 $\frac{1}{2}$ and smaller, 3c. 24-hour service. National Photo Finishing Co., Dept. M, Omaha, Neb.

8x10 FOLDING Camera, Zeiss VIIa Lens, B. L. W. A. Lens Series V in Volute Shutters. C. A. Krebaum, LaCrosse, Wis.

KODAK films developed, 10 cents. Finished paper or Post Cards, 4 cents. Boosa, Celina, Ohio.

OPERATE shutter at any distance electrically. Ke-lo Co., Kansas City, Mo.

ANY roll film developed, 10 cents. Prints, 3 to 5 cents each. Unexcelled work. Profit-sharing co-ops. Columbine Photo Supply Co., 2147 Lowell, Denver.

SPECIAL trial order. We will develop and print your next roll of film, any size (six exposures), for 25 cts. Moser & Son, 20 Arcade, Cincinnati, Ohio.

KODAK Finishing. Send Film and Dice for sample work and prices. Square-Deal Photo Shop, 16 Main, West Calm, Ohio.

MICROSCOPES, Telescopes, Binoculars, Kodaks, bought, sold, exchanged. Enclose stamp. Isaacs, 26 John St., New York.

SEND \$1.50 with 4 negatives for 100 finished postcards; each, 4c. Any roll film developed, 10c. Prints 2 $\frac{1}{2}$ x3 $\frac{1}{2}$, 3c each; larger sizes, 4c each. "Kodak Hints" free. 8x10 enlargements, 25c each. Sample Post-card free. This advertisement will appear again in July issue. Caulkins Photo Works, Oneonta, N. Y.

PHOTOGRAPHIC Retouching Taught: cheap course; learn at home. Y. & M. M. Retouching Co., Dept. M, Marshall, Mich.

FILMS developed 10c, prints 3c to 5c. A reputable Incorporated Company, conducting largest existing plant. Price list and special offer. Enlargements our specialty. Chicago Photo Finishing Co., 54 W. Lake St., Dept. A, Chicago.

SPOT Cash paid for high-grade Kodaks, Lenses and Cameras. Send full description stating lowest price. Cameras exchanged. In business since 1885. David Stern Co., 1047 M. W. Madison St., Chicago.

KODAKS. Cameras, all makes, all sizes. Motion picture cameras, hundreds of anastigmat lenses and speed shutters of all makes at about half regular prices at New York's largest photographic store. Send for largest bargain book. Koehler's Camera Exchange, Inc., 7 East 14th Street, New York.

BIG Money Saved on Photographic Lenses and Apparatus—goods exchanged; repairing done. Ralph J. Golson, 63 East 46th St., Chicago, Department P.

WE buy, sell and exchange. Bargains in Microscopes, Telescopes, Binoculars, Cameras, etc. Bargain list sent. Kahn & Son, Opticians, No. 54 John St., New York. Established 62 years.

FILMS developed 10c, all sizes. Prints 2 $\frac{1}{2}$ -3 $\frac{1}{2}$, 3c; 3 $\frac{1}{2}$ -4 $\frac{1}{2}$, 3 $\frac{1}{2}$ -4 $\frac{1}{2}$, 4c; Post Cards, 50c doz. Work guaranteed and returned 24 hours after receiving. Postage paid. Send negatives for samples. Girard's Commercial Photo Shop, Holyoke, Mass.

SAVE 40% on Photo Paper from factory, prepaid. "Instanto" has a sparkling quality no other gaslight paper possesses, quick printing develops easy. Money back guarantee. Send 25c for 3 dozen postals or 4x6 size, price list and full directions. Photo Products Co., Dept. J, 6100 La Salle St., Chicago.

ROLL Film developed, 10c a roll. Packs 25c each. Prints, Brownies, 2c; 1a, 3x4, 3x5, and Post Cards, 3c each. Work returned next day. Postage paid. Kodak Film Finishing Co., 112 Merchants Station, St. Louis.

KODAK Films Developed, 10c per roll, any size. Prompt attention given mail orders. Prints, 2 $\frac{1}{2}$ x3 $\frac{1}{2}$ to 3 $\frac{1}{2}$ x4 $\frac{1}{2}$, 3c; 4x5 to 3 $\frac{1}{2}$ x5 $\frac{1}{2}$, 4c. J. M. Manning, Box B, 1062 Third Ave., New York City.

MOTION PICTURES

EDISON Motion Picture Machine half price. Bargain list free. National Employment Company, Duluth, Minn.

WRITE Moving-Picture Plays, \$50 each. Correspondence course unnecessary. Details free. Atlas Publishing Co., 304, Cincinnati.

\$25 PROFIT Nightly—Moving Picture Business—small capital starts you, no experience needed. Teach you—furnish everything. Ralph J. Golson, 63 E. 46th St., Chicago, Dept. M.

MAKE a complete Motion Picture Camera and Projector from instructions given in our book Amateur Mechanics No. 4. Full details given. Not hard to construct. Worlds of enjoyment taking and exhibiting subjects dear to the heart. Price of book only 25c postpaid. Popular Mechanics Book Dept., 6 N. Michigan Ave., Chicago.

MOTION Picture Work—A large 618-page book covering every phase of the moving picture, its production and its theatre. Indispensable for reference and instruction to the thousands of workers in the motion picture field. Price \$3, postpaid. Popular Mechanics Book Dept., 6 N. Michigan Ave., Chicago.

WE can show you how to sell your photo-plays, stories and ideas. Quick, profitable sales. Model photoplays and criticisms free. No courses or revision. Proof free. Manuscript Sales Co., Box 300, Hazellhurst, Pa.

BUSINESS OPPORTUNITIES

START Jossop factory and save freight from us. Five seconds demonstration positively astounding to everybody. Exclusive rights. Immense profits. Write for proposition and samples. Jossop Manufacturing Co., 619 So. Broadway, Los Angeles, Cal.

3,000 FORMULAS, Trade-secrets and moneymaking plans, 364 page volume, alphabetically indexed, 5c. Formula Bureau, 3311-E, Belleplaine Ave., Chicago.

PLASTOGRAPHY booklet enables you to make from life durable busts of your friends in imitation marble, bronze, etc. Copies statuary, appeals stronger than photos or paintings. Inexpensive, easily learned, profitable; price, \$1. Particulars free. School Plaques made to order. Box P. P. B. Spahr, York, Pa.

OWN a Business—1,000% profit manufacturing Ink at home, spare time. Capital and experience unnecessary. Enormous commercial demand. Our secret formulas and sure selling plans insure lucrative, steadily increasing business. No canvassing. Investigate immediately. Particulars free. A. Covert, Secretary, 6335-6339 Kenwood Ave., Chicago.

I NEED branch managers for my world wide mail-order business. Operate from your own home in spare time. No canvassing or peddling. Experience unnecessary. You should make \$50 weekly. Butler, 407 Factories Bldg., Toledo, O.

IMMENSE profits selling secret writing code. Impossible to read without key. Manufacture yourself. All profit. Sample code with instructions for quarter. Codigraph, Jeffersonville, Ind.

LEARN to Make Metallic Sign Letters. \$50 to \$50 per week profit. Capital and experience unnecessary. Complete course, \$1. Particulars free. Cushing, 4816 South Vermont, Los Angeles, Cal.

MAKE Big Money mailing circulars. Particulars free. Stanford, Canonsburg, Pa.

MAIL Order Business. We start you right. Furnish everything. Ideal Novelty Co., Desk 8, Palmyra, Pa.

USE your spare time to build up a mail-order business of your own. We help you start for a share in profits. 27 opportunities. Particulars free. Opportunities Exchange, Buffalo, N. Y.

WRITE Moving-Picture Plays: \$50 each. Correspondence course unnecessary. Details free, Atlas Publishing Co., 2046, Cincinnati.

\$30 WEEKLY manufacturing post cards. Easy to learn. Stamp for particulars. Aimer Agency, Jackson, Michigan.

TWELVE years ago I started a small mail-order business at home in spare time with a few dollars capital. I wanted to make \$30 or \$40 a month, evenings. The net profits the first year averaged \$200 a week. Five years' work netted me \$50,000. I will show you how to start a small mail-order business. Send today for my proposition. It's interesting. No canvassing. Heacock, Box 867, Lockport, N. Y.

BEATS 'em all. I get 30 to 40 letters a day, each contains dime. You can do same. Particulars 10c. Hovey, Perry, Okla.

FIVE to 10 dollars per day, sharpening safety razor blades. Automatic machine does all. Experience or big capital unnecessary. Details free. Henderson Machine, 261, Cincinnati.

READ "Booster" and make more money! Operate Mail Order business during your spare time. We'll show you how! Sample copy, 10c. Booster Magazine, Northwestern Building, Chicago.

BECOME Steam Engineer. Make \$100 monthly. Questions and answers for license, complete—25c. Gen. Olive, Willmar, Minn.

BIG Income in hard times! I want to start you selling by mail a wonderful little proposition that just fits the times. Intended to sell for two dollars, but owing to tight conditions you sell it by mail for 50 cents and clear 48 cents on every order! I want you to have a sample, but cannot afford to give it away to everybody. Evince your interest with a dime for expenses and I'll send this sample, with the whole story of how I start you selling it, and see you through. I furnish everything. Benj. Burdick, G82, Kalamazoo, Mich.

"HIRE Yourself as Boss." Big corporation will back you in Money-Making Mail-Order Business selling Guaranteed Goods. Start spare time. Small capital. No canvassing. Wm. J. Dick, Mgr., Dept. J-10, 20 W. Lake St., Chicago.

LARGE Chicago Advertising Organization desires local representation. Investment of \$300 necessary. Fully secured. Chance to establish in permanent and paying business. Merchants Advertising Service, 716 Medinah Bldg., Chicago.

OWN a business. Co-operate with me evenings at home. Everything furnished. Don't worry about capital. Boyd H. Brown, Dept. H-5, Omaha, Nebr.

PROFIT-Sharing Mail-Order Plan; absolutely new. Goods, literature furnished. DeLoce Distributing Co., Station B, Baltimore, Md.

WE start you in business, furnishing everything: men and women, \$30.00 to \$200.00 weekly operating our "New System Specialty Candy Factories" home or small room anywhere; no canvassing. Opportunity lifetime: booklet free. W. Ragsdale Co., East Orange, N. J.

HAND-BROUGHT Copper Novelty. Full course of instructions, blue prints. Make your own tools. Sale pointers. All for \$1.00 with free 50c sample, by mail prepaid. No fake. L. Llewellyn, 1312 Bonnie Brae, Los Angeles, Cal.

BE independent; own a Wallpaper-Cleaning Business; whole or spare time; \$150-\$300 a month easy; big profits; no experience required; my booklet shows you how; write today. Milliken Co., Davenport, Iowa.

Big Kansas Company will start ambitious man or woman in fast growing business; any locality; \$3,000 yearly; spare time; no canvassing; no experience. We furnish everything. Write for unique selling plan. C. W. Eyestone, President, 174 E. 5th, Pittsburg, Kansas.

MAIL Order Beginners, Agents, Opportunity Seekers. Write for my free literature. H. B. Esser, Box 476, Baltimore, Md.

INCREASE income at home. Particulars free. 1116 Monroe, Rochester, N. Y.

EXCHANGE factory rights, salable shop tool, no competition. S. Grove, Allensville, Pa.

"HOW to Write a Pulling Ad" sent free upon request. Cope Agency, St. Louis, Mo.

RESILVERING Mirrors. Renewing Dry Batteries, 150 selected formulas 25c. Formula Service, 3311-E, Bellefontaine Ave., Chicago.

WE will start you in the cleaning and dyeing business, little capital needed, big profits. Write for booklet. Ben-Vonde System, Dept. C, Charlotte, N. C.

"DOLLARS" yearly in your back yard. No ginseng, mushroom dope. New ideas never before published. Particulars free. Metz, M., 182 W., 34th St., New York.

ADVERTISERS, Mail Dealers: Our 1915 Rate Book lists 2,000 Principal Publications, rates, circulation. Includes 30 Mail-Order Plans. Price 10c. Dearborn Advertising Agency, 210 Franklin Bldg., Chicago.

OPERATE profitable mail order book business. 700% profit each sale; small outlay, everything furnished. Spare time. Particulars free. Hollins, Box 5272, Boston.

ONLY \$200.00 required to start profitable money-making business of your own, handling Punch Board Assortments, showing 100% profit. Washington Sales Co., Department P, Chicago.

\$8.00 PER day easily made with our plan; write for proof and sworn statement, tells how. Dept. 56, National Distributing Association, Flint, Mich.

SEND stamped envelope for information on the biggest mail-order system with the smallest investment. Specialty Co., Box 355, Bridgeport, Conn.

OPERATE independent, profitable Post-card Exchange; \$5.00 capital required. My advice with years' experience mailed. \$1.00 Membership, 10c. W. Lee (Pres.), Bryn Mawr, Wash.

EXCLUSIVE territory for local manager—selling auto accessory. Big profits. Get our free sample offer. Scientific Products Co., Ashland, Ohio.

MONEY in contracting. Spread San-tite floors; sanitary; fire-proof. \$150 to \$300 made monthly contracting kitchen floors alone. Instructions telling how to make and spread sold outside this district for \$3. San-tite, Washington, Indiana.

LEARN Tartaric Mirror Silvering—it pays. Barstow, 513 23rd St., Oakland, Calif.

MAIL-ORDERER Beginners, postal brings interesting literature. Send for it—Free. L. M. Lewis, 13 Vestry St., Haverhill, Mass.

HERB Recipe Book and Herb Catalog, 10c. Teaches how to make medicine from herbs for all diseases. Herb Gardens, Dept. 44, Hammond, Ind.

MAKE \$50.00 monthly furnishing commercial reports; no canvassing; good opportunity; co-operative offer free. "Cico," PMC, Peru, Indiana.

AN UNUSUAL opportunity for a man with \$5,000 to \$8,000 cash, with a knowledge of machinery, to invest in a combination rice, grit, syrup mill and cotton gin, in a live town on the Gulf Coast. Nearly all Northern people. No special knowledge of the above required. Climate very beneficial for Asthma, Catarrh, Hay Fever, Rheumatic and Kidney Troubles. Purest water. No malaria. Attractive surroundings. Foley & Co., 2835-2843 Sheffield Ave., Chicago, Ill.

CAPITAL wanted to manufacture an original cushion, non-slip, heel plate for shoes, just patented. Fine Mail Order and Agent's article. Hugh G. Robinson, Box 265, Oakland, Calif.

LIVE men for a lucrative business proposition which requires small investment for exclusive automobile necessity. No experience necessary. Write Peerless Motor Specialty Co., 2 Columbus Circle, New York.

FIFTY Dollars weekly easily made. New advertising feature. Send twenty-five cents for proposition. Empire Advertising Company, 87 Plymouth Avenue, Buffalo, N. Y.

OPPORTUNITY is knocking at your door. Owing to the war, many common weeds are now of great value. Dandelion has doubled. Our treatise on roots, herbs, barks—collecting, curing, selling. Thirty cents, postage. L. J. Brown & Co., Muskegon, Mich.

HOW to Operate a Mail Order Business, 30 Big Profit Plans and year's mailing service sent for 10c. Mail Dealers' Wholesale House, 521 Franklin Bldg., Chicago.

\$5 DAILY easily earned at home, spare time, silvering mirrors; no capital. Free instructive booklet tells how. Patterson & Co., Dept. 8, Brooksville, Ky.

"PROTECTING Inventions Before Patent Without Cost," next issue Inventor's Advocate, Advocate Building, 14, Washington, D. C., one year, 25c; three months, 10c.

PATENT Application fully prepared. \$10. Why pay \$25? Particulars free. Patent News, Dept. 20, Washington, D. C.

WOOD Stains, complete instructions. \$1. Mahogany, birch, maple, ebony, mission, early English, walnut, oak, etc., etc. Roth, A-45 Frost St., Brooklyn, N. Y.

OPERATE Hahn's Premium Machines, the best seller for cigars and candies. J. Hahn, 1016 Germantown Ave., Philadelphia.

START in the Carpet or Clothes Cleaning Business now. Thurman Vacuum Process unequalled for commercial cleaning. We show you how. Easily learned. Only \$125 capital needed to earn good income in towns of 2,000 and over. Write today. Thurman Vacuum Cleaner Co., Manufacturers all types Vacuum Cleaners, Dept. H, St. Louis, U. S. A.

LEARN the Real Estate Business. Our complete instruction book teaches: Listing, Appraising, Management, Salesmanship, Insurance, Brokerage, Advertising, Renting Agency, Forms, etc. 121 subjects. Exclus \$20.00 correspondence course. Buckeye cover, 75c. Silk cloth \$1.00 postpaid. Realty Book Company, 5952 Euclid Ave., Cleveland, Ohio.

CONDUCT a "Candy Kitchen." Clear \$5 to \$25 daily. Small capital required. Particulars free. The Kemmon School, 142 W. Ontario St., Dept. A, Chicago.

LET the parcels post help you. Add (\$15 to \$25 weekly) to your present salary or income. Start during spare time and build up a permanent mail-order business of your own. We show you how and help you make good. No canvassing. Experience unnecessary. The Parcels Post makes success doubly sure. Our new ideas and up-to-date plans bring the money. No so-called "Course of Instruction" to sell. We give that free. Write today. Address Peace Mfg. Co., Inc., Dept. A, 70 Broadway, Buffalo, N. Y.

BE WISE. Don't experiment in mail order. I can tell you how to succeed. B. Newnam, Waukegan, Ill.

MANUFACTURERS, Promoters and Patent Buyers are invited to write us stating the line of invention in which they are interested, as we can supply their wants in any class of patents. Victor J. Evans & Co., 162 Ninth St., Washington, D. C.

WOULD You Like to Own a good-paying mail-order business? We have a line that gets repeat orders all the time. You can start in spare time; invest a dollar or two a week and soon own a nice business of your own. Particulars free. Nadler, 1064 Belmont Ave., Chicago, Ill.

INDEPENDENCE and fortune quickly attained in the Manufacturing Mail Order business. I furnish Formulas, Manufacturing Processes and Trade Secrets in all lines. Sold under positive guarantee; 18 years' practical experience. Revision and improvement of Formulas and Processes—reduction of manufacturing cost—utilization of waste materials, etc., a specialty. Booklet, Formula List, and Valuable Information Free. W. L. Cummings, Ph. D., 127 Standard St., Syracuse, N. Y.

STOP Here! Let me start you in a home business that will bring you money every day. Experience unnecessary. Spare time. No canvassing. I furnish everything. Send for pesos. Voorhees, Dept. C, R., Omaha, Neb.

PATENTABLE ideas wanted—Send for 3 free books. R. B. Owen, 30 Owen Bldg., Wash., D. C.

IF you want facts instead of fancies about Patents, address Benjamin & Bassett, 140 S. Dearborn St., Chicago.

LEARN to collect money. Good income; quick results. Send for free booklet, "Skillful Collecting." Collectors' Association, Long Street, Newark, Ohio.

I WANT to send you proof of the wonderful pulling power of Popular Mechanics classified pages. What's your proposition? Write me today. F. W. Johnson, Classified Dept., Popular Mechanics Magazine, 6 N. Michigan Ave., Chicago.

ONE beginner makes \$200 per week operating an original mail business we planned. You can. Small capital—spare time—experience unnecessary. No "Outfits" or "Instructions." Proof free. Success Mint, 400 Main, Smithport, Pa.

MAIL ORDER SUPPLIES

INCREASE your sales. Place your proposition before the readers of "Cartoons Magazine." 20,000 copies guaranteed every month. Classified rate 2c per word. Mail in a trial ad today. Cartoons Classified Dept., 78 E. Madison St., Chicago.

DUPLICATORS AND DEVICES

\$2.40—THE "Modern" Duplicator. 30 days' free trial—32,846 firms use it to make 50 to 75 duplicates ("Made in U. S. A.") copies of each letter, or anything written with pen, pencil or typewriter. Brochure free. Main office, J. E. Durkin & Reeves Co., 339 Fifth Ave., Pittsburgh, Pa.

A DUPLICATOR \$1.00, Letter size. Make over 50 copies from pen or typewriter original. Send for circulars. Scientek Laboratories, Dept. L, Madison, Maine.

TO MANUFACTURERS

WE desire to correspond with manufacturers seeking locations. We have a rail-road, about to be constructed through territory where steam coal can be had at 75¢ a ton; electric power at 1¢ to 1½¢ a k.w. hr.; gas, 1¢ to 8¢ per M. Road touching or crossing seven streams, offers exceptional opportunities for manufacturers of all kinds. Territory rich in pottery, brick and tile clays; fine quality of limestone and cement rock. An exceptional town site, with the above-named fuel and power supplies, with three railroads—32 passenger trains daily. Good factory sites in 30 towns along the line. Address W. H. Room 25, 78 E. Madison St., Chicago.

MANUFACTURER'S Agent wishes to be placed in touch with Manufacturers of high-class Hardware and Woodenware Specialties. Cameron Bros., 615 Central National Bank Bldg., St. Louis, Mo.

FOR ADVERTISERS

ADVERTISE your business, paint all kinds of attractive signs with our stencil letters—one inch up to four feet high. Special 1½ inch high 10¢ apiece. Particulars, Bir Sign Co., Fort Wayne, Ind.

500 ADS. every month, Big List 100 magazines—5¢ word—\$4.00 inch. Send order now. Magazine, lists free, Stanford, Canonsburg, Penna.

10,000 BOYS read our 9x12 magazine. Display 6¢ line; minimum 42¢. Classified 1¢ word, minimum 25¢. Two insertions 15% discount. Youths' Magazine, Chicago.

ADVERTISE—in Barkley's Magazine 2c word. Barkley's Magazine, Mount Pleasant, Pennsylvania.

MORE business at less cost. You want the dollars you put into letters. Follow-ups, ads; circulars, folders, booklets, to accomplish just that. Therefore write Harrmann, No. 1 Sutton Place, New York, for sales help.

ANYBODY can write a sales letter, but everybody will not read it. Only few people can write in such form as to make all people read. Try Martin & Miller, Advertising Counselors. And address their Business Department, 239 Fourth Avenue, New York.

ADVERTISING SERVICE

FIRST class display advertisements, \$5 each. Circular letters \$5 each. Advertisers' Service, 1809 Lincoln St., Evanston, Illinois.

LETTERS and advertisements written—to accomplish your purpose. Free criticism of your present literature will show my grasp of your individual problem. Dunbar, 1513 Rotunda St., Boston.

WANT more orders? My follow-up letters get 'em. Strong, pulling copy that "brings home the bacon." Send your literature for free criticism. I can turn your prospects into customers. C. T. Anderson, 1934 Waverly Ave., Duluth, Minn.

PERSONAL

FREE—Stop using Tobacco-Free. We will give you free information how to conquer the habit easily and permanently. Results guaranteed. Anti-Tobacco Remedy Co., Dept. G, Omaha, Neb.

USED Tobacco 40 years, a permanent cure in 72 hours; full particulars, \$1. Box 72, Pioche, Nevada.

RECEIVE valuable mail, ten cents, P. Cornish, Schenectady, N. Y.

STAMMERERS. Attention! I can cure you at home by my mental training course. Particulars free. R. Arnould, Keene, N. H.

BROTHER—Accidentally discovered root cures tobacco habit. Gladly send particulars. F. Stokes, Mohawk, Florida.

AGENTS WANTED

IN open territory for our Special Value Big 4 line for the coming Fall and Winter Season 1915. Four pieces only. Tailored suits to measure at \$15.00, \$20.00, \$25.00 and \$30.00, retail. Fit and workmanship guaranteed. Full assortment to sell at \$15.00. Prominent agents now handling line pronounce it easiest selling and most satisfactory and profitable ever handled. Applications also solicited from representatives of co-operative societies, church organizations and suit clubs formed for mutual benefit. Give full particulars with application. Nelson Tailoring Co., 241-245 West Van Buren Street, Chicago.

AGENTS Wanted—If you know a chance when you see it you'll see this one now. Big money—stylish, nifty clothes—little work—no experience or capital needed—can you beat that? We want agents everywhere to take care of our business in their localities and to advertise our nobby, nifty suits by wearing them. We furnish everything, complete, and charge nothing for agent's outfit. The swellest dressers everywhere are our agents and all we ask is that you tell people who inquire about your fine clothes where and how they can get them. You make big money—\$10 a day—without trouble. Just a postal brings you full outfit free. Big, new sample book of up-to-the-minute suitings sent so you can pick out your first suit; also measuring blanks and everything you need. We pay express on everything—not a penny for you to pay. Send quick before some one else gets the agency there—mail postal today to the American Woolen Mills Co., Dept. 514, Chicago, Ill.

WE are the largest manufacturers of twisted Wire Brushes in America. Highest grade goods, best service, largest profits. Our new Auto Specials are winners. Send for catalog. Fuller Brush Company, Hartford, Conn.; Rock Island, Ill.

GUARANTEED Solid Gold Self-filling Fountain Pen. Fills in 2 seconds, cleans automatically. Not sold in stores. Agents get busy. Sample 75¢, sells \$2.00. Money back if you want it. S. Mfg. Co., 41 Warren St., N. Y., Pen Dept. 4.

AGENTS: Get particulars of best proposition now on market. North Carolina Mfg. Co., Dept. 16, Washington, N. C.

AGENTS—Vacuum Sweeper. New design; big profits; easy to get orders: \$30 to \$60 weekly. Roy Metcalf, General Manager, Penn Yan, N. Y.

AGENTS: Don't fool with trinkets. Sell the Motometer, just patented. Retails \$5. Write today. Steele, Box 1, Wilkinsburg, Pa.

NEW 1915 Model—Send no money, just your name on a postal card, and learn by return mail how to get the best Vacuum Cleaner made, without costing you one cent. Shipped direct from factory, guaranteed for 5 years. Reliable. Live agents wanted. The Warner Company, Dept. Z, Muncie, Indiana.

BIG Kansas Company will start ambitious man or woman in fast growing business; any locality; \$3,000 yearly; spare time; no canvassing; no experience. We furnish everything. Write for unique selling plan. C. W. Eustone, President, 160 E. 5th, Pittsburg, Kansas.

FREE Sample—Nospash Water Strainers sell themselves—no talking—experience unnecessary. Profits big. Send 2¢ (mailing cost). F. A. Union Filter Co., New York.

AMBITION Men-Women, 18 or over, wanted. Government Jobs, \$45.00 to \$150.00 month. Full list of positions now obtainable free. Franklin Institute, Dept. S-22, Rochester, N. Y.

AGENTS wanted for portraits. Deal direct with the artist, Frank Wanderley, Wheaton, Ill.

"MARVELOUS"—Expanding cuff button. Slip your cuffs up or down upon forearm without unbuttoning. Positively stay where you place them. Reduces laundry bills and fills a positive want, practical, guaranteed. Exclusive territory. Fastest selling specialty on market. This is a high-grade proposition. Large money maker. Agents wanted everywhere. Flexo Cuff Links Co., Sheboygan, Wis.

A \$2.50 PREMIUM with every \$1.98 sale and 70 cents profit for you means big daily profits. Free samples. Address Bloom & Black Company, Trenton, New Jersey.

YOU can make big profits selling our Pure Aluminum Kitchen Utensils—Guaranteed for 20 years. Our specialties are not sold in stores, and they get the business for you. \$200,000 firm and liberal credit plan backs you. We have an attractive General Agency offer. Wm. J. Dick, Manager, Dept. J-21, 28 W. Lake St., Chicago.

AGENTS—Sell the Primus, genuine Swedish wickless, coal-oil stoves, Smokeless, odorless. Twice the heat of gasoline at one-eighth the cost. No danger of explosion. Big profits. James Anderson & Sons, Sidney, Ohio. American distributors.

YOUNG Man, would you accept a tailor-made suit just for showing it to your friends? If you live in a town smaller than 10,000, write Banner Tailoring Co., Dept. 50, Chicago, and get beautiful samples, styles and a wonderful offer.

SIGN Letter Agents and Painters: 500% Profit Gold and Silver Sign Letters for Stores and Office Windows. Anyone can put on. Big demand. Free samples. Metaline Letter Co., 404 N. Clark St., Chicago.

ACTIVE permanent agents (men and women) to sell Moore Self-Winding Clothes Line and Reel. Only perfected article of its kind. Line keeps clean and dry, never gets tangled; easy to put up and take down, winds up automatically. Every good home a sale at a good profit. Send today for agent's book—"Plenty of Sales and Plenty of Profit." Moore Drop Forging Co., Dept. A, Springfield, Mass.

AGENTS—Drop dead easy. Awake! Grab this new invention. Low-priced, water-power home massage machine. Magical, marvelous, mysterious. New field. Big profits. Sold on money-back guarantee. "Margrath sold 5 in 10 minutes; 31 in 2 days." "Parker sells 8 first day." Vaughn, "your machine has merit. Express 6 dozen." Free information. Blackstone Co., 33, Meredith, Toledo, Ohio.

AGENTS make big money and become sales managers for our goods. Fast office sellers. Fine profits. Particulars and samples free. One Dip Pen Company, Dept. 2, Baltimore, Md.

AGENTS—Delicious Soft Drinks in concentrated form. Always ready—just add water—economical—absolutely pure. Every housewife wants them—14 different kinds. Enormous demand. Big summer sellers—money comes easy. 250 other popular priced, fast selling, household necessities. We furnish free outfit. Write today—now. American Products Co., 2229 American Bldg., Cincinnati, O.

PERFECTION Pocket Adding Machine. Lightning seller. Agents wanted. Cincinnati Specialty Mfg. Co., Dept. B, Cincinnati, Ohio.

PHOTO Pillow Tops, Portraits, Frames, Sheet Pictures, Photo Plates, Pennants. Rejects credited. Prompt shipments; samples and cat. free to agents. 30 days' credit. Jas. C. Bailey Co., Desk A-5, Chicago.

WINDOW Lustering Business. We start you free. Everglite Co., Dept. P., Long Island City, New York.

JUST OUT. Machine Safety Razor Sharpener. Blades can be used 100 times. No strap to cut, no hook in wall. Saves its cost each few months. Agents go to it. Sample \$1.25, sells \$2.50. Money back if you want it. S. Mfg. Co., 41 Warren St., N. Y. Machine Dept. 4.

AGENTS: Magic Metal Mender, mends Enamel, Tin and Aluminum Ware, Brass, Copper, etc., without soldering irons or acids. Sample 15¢. Faam Novelty Co., 265 Monmouth Bldg., Chicago.

\$61.50 WEEKLY introducing and selling a new gas light burner for kerosene lamps. Beautiful light. No chimney. No mantle. Perfectly safe. Simple in construction. Nothing to get broken or out of order. Will not burn out. Durable. Will last for years. Low price. Easy to sell. 300 per cent profit. Experience not necessary. Sample free. Why not try one on your lamp? Beware of imitations. No branch offices. Luther Manufacturing Co., Dept. 34, Cincinnati, Ohio.

SELLS like hot cakes. New Ironing Wax, holder and asbestos rest. Perfumes clothes. Nothing like it. Working outfit 5¢. MBR Mfrs., 12 Water St., N. Y.

POSTCARDS, 90 thousand. All kinds. Sample 25¢ assortd 10¢, postpaid. Mitchellson, 27 West 130th, New York.

WANTED, Agents—General Agents for Specialty. Sells to every Shoe and Repair Shop, Nation Store, House and Office. Big money for hustler. Gilliam Mfg. Co., Box A, Canton, Ohio.

\$3 TO \$10 daily easily made silvering Mirrors. Wonderful new Tartaric Price opens enormously predictable business. Particulars free. A. Barstow, 514 23rd Street, Oakland, Calif.

THE Add-Phone attached to a telephone makes hearing easy in noisiest places. Every telephone user wants one. Wagner Co., 1052 People's Gas Bldg., Chicago.

AGENTS Wanted—Right here is the one big chance of your life. If you want to make good money—\$10 a day or more, as easy as rolling off a log, and get your swell clothes free besides, you can do it by acting as our agent. We are the biggest people in the business and want our agents to make big money and be nifty, stylish dressers. Send a postal today for free \$10 outfit, including a big book of nifty suitng samples to select your swell agent's suit from. Then take orders from people who admire your nifty clothes. They come to you—not you to them. This is the way to get rich—the sure, easy way. Remember, you need no money—everything is furnished by us free. We pay express on everything. Just send a postal, but do it today. You can't get started too quick, making this big money and wearing these stylish clothes. Address card to Paragon Tailoring Co., Dept. 514, Chicago, Ill.

"**BILLY Sunday's**" wonderful sermons and quick-fire sayings take country by storm. Agents now making \$6 to \$15 daily selling "Sunday's" only authorized book: illustrated. Marvelous seller anywhere. (Unusual proposition to mail dealers.) Got next! Marvello Company, Binghamton, New York.

AGENTS—Big money selling our household specialties. Write for catalog. Kremsdahl Co., 460 Wilbraham Road, Springfield, Mass.

AGENTS—Business your own \$15. Turn capital two or more times a week; 340% on turn; big winner; repeats; sells 25¢; Doubtless, 698 Dearborn, Chicago.

AGENTS: Make \$100.00 next week. You can. Others do. New invention. Washes while boiling. No rubbing. Generates own power. Forces 20 streams suds through clothes. Outselling everything. \$1.50. Free sample. Geyser Washing Machine Works, Chicago.

MEXICAN Diamonds exactly resemble genuine; same rainbow fire; stand tests; sell on sight. We need few more live agents. Profits \$50 weekly and up. Write quick for sample case offer free. Mex. Diamond Importing Co., Box A, Las Cruces, N. Mex.

EARN \$200.00 to \$500.00 per month co-operating with us, from your home. Address "Ewing Company," Parkersburg, W. Va.

FOUR dollars' worth of my goods free, send red stamp for particulars. Haifstanger, Ridgefield, Conn.

INTRODUCE "Jap-Silk Non-Breakable Gas Mantle," new in America, lasts longer, throws greater light, fits standard inverted burners, rapid seller. Exclusive territory given. Particulars upon request. P. Jules, 205 W. 48th St., New York, N. Y.

SILVER Plated, Self-Filling Pen. No dropper required. No rubber ink-bag. No "mucus" fingers. Dip pen in ink, resealable file instantly. Lasts indefinitely. Agents wanted everywhere. Quick sales, big profits. Sample ten cents, none free. Ed. H. Irwin, Box 1201, Carthage, Mo.

PORTRAIT Agents deal direct with the artist. Write for prices. Better work and better service. Geo. Price, 111 W. Erie St., Chicago.

\$30 WEEKLY easily selling Ladies' Combination Hand Bag, appealing to every woman. G. C. Coffman, Box 56, Huntingdon, Pa.

AGENTS—Earn \$30 to \$50 Every Week selling the New Improved Monitor Self-Heating Flat Iron. Positively the lowest priced and fastest selling iron made. Over 650,000 already sold. Evans, N. Car., sold two dozen on Sat. Mrs. Nixon, Vt., sold eight first half day. Every housewife wants one. Every iron guaranteed. New terms. Exclusive territory. Sample free to workers. Write today. The Monitor Sad Iron Co., 677 Wayne St., Big Prairie, Ohio.

20% PROFIT. You can't beat it. Sells everywhere. Free pocket sample. Our goods get the orders. Wm. J. Dick, Mgr., Dept. J-4, 20 W. Lake St., Chicago.

AGENTS—Unusual opportunity to earn a steady income and control the sales of the best office and resident necessity on the market; sample fits vest pocket; can sell every telephone subscriber one for each phone; demonstration will make sale. Write for full particulars, selling plan and exclusive territory. Myrophone Company, 1133 Broadway, New York.

OWN a Business—100% profit manufacturing Inks at home, spare time. Capital and experience unnecessary. Enormous commercial demand. Our secret formulas and sure selling plans insure lucrative, steadily increasing business. No canvassing. Investigate immediately. Particulars free. A. Covert, Secretary, 635-639 Kenwood Ave., Chicago.

AGENTS—If you are making less than \$200 per month—no matter what your locality—you will be interested in our "Sentinel Burglar Alarm" proposition. Brand new invention. Instantly attached any door knob. Impossible turn knob without ringing bell. No batteries, screws or nails. Handsomely nickel-plated. Retail price \$1.00. Provides perfect and cheap burglar insurance. When demonstrated sells on sight to homes, offices. Patented. No competition. Exclusive territory free. For \$1.00 we will send one with full particulars. If not entirely satisfactory, return it and we will refund your \$1.00. You risk nothing and have everything to gain. We know you will be delighted and will exclaim like all others—"Here at last is a real seller and big money maker." Let us prove it. Write today for liberal terms to agents, Marshall Dobbing & Co., 1422 Marquette Bldg., Chicago.

AGENTS—\$50 weekly; sell our 15 household inventions; general agents getting rich; every home buys one or more; samples furnished active workers. Oettinger & Co., 1309 13th St., Altoona, Pa.

MAGIC Ink Eraser. No blade, no acid. Removes ink like magic. Sells like bread in a famine. Sample 10c. Sells 25¢ to 35¢. S. Mfg. Co., 41X Warren St., N. Y.

EXCELLENT proposition selling household specialties. Get busy. Catalogue and particulars free. W. F. Eshelman, Huntingdon, Pa.

BIG PROFITS—H. O Sliding Casters. Pocket samples. Easy to attach. Saves floors and carpets. Homes, offices, hotels, buy quantities. 540 Dickey Bldg., Chicago.

HOUSEHOLD article sells like lightning. 10% profit to hustlers. Chas. Eads, Valentine, Neb.

KEROSENE Gas Burners in Cook Stoves or Ranges stop use of wood or coal. Recently patented. Money-maker for agents. The Vapor-Gas Burner Co., Columbus, Ohio.

READ the Agents Magazine and make more money. 2 issues 10c. Agent's Magazine, Chicago.

AGENTS—Air Cell Washing Machine. New, marvelous invention. Excels work of washers costing \$25.00 and up. Sells only \$1.00. No wonder every home buys. Exclusive territory free. Nearly 200% profit. Write today. Air Cell Washer Co., 3937 Detroit Ave., Toledo, Ohio.

NEW Automatic \$2.50 Adding Machine. Sell 10 a day easy. Big profit. Everyone buys. No competition. Repeat orders. A. Bassett, 5921 Indiana Ave., Chicago.

JIFFY Ironing Board Cover and Clamps is the biggest red-hot seller ever invented. 150% profit. No competition. Lake Shore Manufacturing Company, Michigan City, Ind.

AGENTS—Snappiest Household Line on Earth. Red-hot sellers, steady repeaters. Goods guaranteed. Over 100% profit. Write quick—hurry. E. M. Feltman, Sales Mgr., 360 Third St., Cincinnati, O.

AUTOMATIC Aluminum Tea Kettle Kettle. Latest invention. Self-opening and closing. No scalding hands. Sells when demonstrated. Satisfaction guaranteed. Sample 25¢ postpaid. Rollins Co., Tremont Row, Boston.

AGENTS, stop until you get our catalogue! We have a great proposition for men and women agents. Write today. T. H. Snyder Co., 12 E. Third St., Cincinnati, Ohio.

DISTRICT Managers, have few openings for live district managers to handle exclusive territory. Staple specialty for hardware and automobile trade, exceptional standing and financial ability to carry stock for retail trade essential. Liberal commissions on jobbing accounts. Junkins Bros., 962 W. 11st St., Chicago.

AGENTS Wanted—4 to 10 dollars a day. Address Sunjoco Ventilating Lock Co., East Chicago, Ind.

GENERAL Agents and Glassware Jobbers. The greatest 30¢ article, sells everywhere. Send 30¢ for sample and particulars. Schoenherr & Pease, East End Pittsburgh, Pa.

IF we had your address we'd show you how to earn \$25, not one week, but weekly. Send 10¢ for samples. Money back if you want it. S. Mfg. Co., 41H Warren St., N. Y.

ADVERTISE—20 words in 100 monthlies, \$1. Sample magazine free. Cope Agency, St. Louis, Mo.

WANTED—Man or woman of good character in each town to take orders and distribute free goods as advertising; experience unnecessary; references required; \$15 a week to start. Address Hudson King & Co., 2 South Clinton Street, Chicago.

AGENTS: \$1,000 to \$3,000 yearly selling over eighty every-day articles to farmers. Pleasant, permanent business. Full instructions. Big chance. Write quick. Duoform Factories, Duoform Company, North Java, N. Y.

OUT they go! "How to Get Rich" and 29 other books postpaid straight to you with catalogues for only 25¢. Also circulars of war books, show cards, post cards, White Slave books, rare books, songs, joke books, tricks, games, musical instruments, novelties, etc. Ward Publishing Co., Box 431, Chicago.

AGENTS—Salary or commission. Greatest seller yet. Every user pen and ink buys on sight. 200 to 500 per cent profit. One agent's sales \$420 in six days; another \$82 in two hours. Monroe Mfg. Co., X 6, La Crosse, Wis.

PIONEER Brand Food Flavors: Hygienic Milk Bottle Holders; agents wanted; popular specialties; descriptive circulars free. Weymouth Household Supply Co., Dept. Y, Box 387, Springfield, Mass.

AGENTS: A free course in General Salesmanship is given to every man of our Sales Organization. This organization is a body of successful men selling the Handy Light, that unique electrical device which cuts the cost of electric lighting in half. Sells for \$3.50, is used in home, office, store, factory; weighs only one pound. Sold by demonstration. All agents furnished with well planned methods for gaining interviews. A high-grade business for a man of ability and standing in his community. General Agents preferred. Inquire for our full proposition by addressing The Handy Light Co., 1102 Handy Light Block, Cincinnati, Ohio.

AGENTS—If you make less than \$1 per hour, write us; we manufacture new household necessity; patented; low price; wonderful seller; not sold in stores. Tyler Co., 1210 Main St., Munce, Indiana.

AGENTS are earning money selling our big 10c Packages of 20 Assorted Postal Cards, "5,000 Varieties." "Big Profits." Sell everywhere at Sight. Sample Packages 10c. Particulars Free. Sullivan Card Co., 1254 Van Buren St., Chicago, Ill.

STOP here and write The Sign Co., Silver Creek, N. Y.

ALUMINUM 16-Piece Combination Roaster and Cooking Set. \$1. Sells at \$3. Agents go to it! A winner of winners. S. Mfg. Co., 43 Warren St., N. Y.

AGENTS—Average \$5 to \$12 daily selling astonishing Aztec massage machine. New. Just patented. Different. No electricity or water power required. Nothing complicated. Affords exhilarating massage without cent expense. Lowest priced, but best outfit. Retails \$2.50 allowing you big end of the profit. Particulars and "beauty" folder free. Aztec Remedy Co., Dept. 132, Toledo, Ohio.

AGENTS—Make \$30.00 week Selling our Specialties. Send 25¢ for samples, get wholesale price of Mopex makers. The Electric Appliance Co., Inc., 1891, Burlington, Kansas.

SIGN Agents, attention: We have something to offer you that beats selling other people's manufactured letters and signs all to pieces. No previous experience is necessary. Investigate. Address: Ross System, 291 Lincoln Inn Court, Cincinnati, O.

NICE income easily earned with quick, sure sellers; permanent position; free samples. Will Sales Company, Syracuse, New York.

JEWELRY Scarf Pins. \$1.30 dozen. Money refunded if not satisfied. Classic Jewelry Co., Lynn Street, Providence, R. I.

LIVE Agents and Mail-Order Men Wanted to get busy on the latest pencil sharpener on the market. Sells for 15¢ to everyone; no cut fingers, no sharings on the floor. Stops all yelling at the kids when they dirty the floor. Indestructible, re-sharable blade. Send 25¢ for sample. Proposition and book on salesmanship with first letter. Get busy, men out of work, and make money. 100 to 150% profit to live ones. Deposit Co., Majestic Bldg., Detroit, Mich.

AGENTS—New mighty money-making marvel. World startled. New marvelous clothes-washing crystal. Clothes-washing ideas revolutionized; positively abolishes rubbing, washboards, washing machines—women astounded, wild over it; absolutely harmless; \$1,000 guarantee goes with it; make \$50 to \$100 weekly easy. Exclusive territory, no experience necessary; credit granted; own a business, supply customers; pocket big profits; nature's mighty elements do work. Harry! Write today—get overwhelming proof, all free. Equitable Corporation, Dept. 267, 215-217 W. Superior, Chicago.

POPULAR MECHANICS ADVERTISING SECTION

PATENTS granted. Customers all ages wildly enthusiastic. Buy on sight. Agents with car for music are becoming financially independent. Osborn Mfg. Co., Masonic Temple, Chicago.

AGENTS: You can make big money with our summer special. Sample and particulars for ten cents. Henderson Supply Co., 324 M. 57th St., Brooklyn, N. Y.

SOAP Agents and other canvassers—For profitable side line, fitting into your regular work, write Lehman Mfg. Co., Richmond Hill, N. Y. City.

AMERICA'S Daily Necessity. Stamp brings sample. The Simmons Co., Hicksville, Ohio.

AGENTS—If you want to receive many desirable propositions to select from, tell us what line you prefer. Canvassing Agents' Registration Bureau, 123 Hart St., Providence, R. I.

AGENTS—Here's a winner. The Midget Vest Pocket Garment Hanger—sells on sight. The most attractive proposition ever offered. 150% profit. No competition, as article is fully protected by U. S. and foreign patents. Address: Dept. "M." The Silver Company, 171 Madison Ave., New York.

SEND 10c for six household guaranteed formulas for home manufacture. All big sellers. Collyt Laboratories, 573 W. Washington St., Chicago, Ill.

PORTRAIT Agents: Our goods will make you big profits. Delivery guaranteed. Rejections credited. Prompt shipment. Low prices. Catalog and samples free to workers. Adam J. Krull & Co., 602 Blue Island Ave., Chicago, Ill.

AGENTS: So many lady and gentlemen hustlers have accepted our liberal offer to trust them to \$3.00 worth Starr's Powdered Enamel which repairs chipped and rusty spots on graniteware, stops all leaky kitchenware, metal and slate roofs, eavesposts, oil-cans, etc., that we will continue our offer for a short while longer. A household necessity with no dull seasons. Beware of would-be imitators. Prepaid sample with particulars, 10c. Starr, 1910 Monroe St., Toledo, O.

ICELESS Milk-Bottle Cooler. Keeps milk and cream from souring. Absolutely new. Retailis 50c. Dept. #5 A. Edmund Feeny Co., Muncie, Indiana.

STOP here and write The Sign Co., Silver Creek, N. Y.

U. S. GOVERNMENT uses Richmond Extinguishers that kill gasoline fires. Four sizes. Three kinds. District Managers make 500% profit. Auto free. Richmond Chemical Co., Room 49, Wheeling, W. Va.

AGENTS—\$13 profit, two sales a day. Machine for saloons. Big seller. Free sample, salesmanship course. Write Mohler, Moran Building, Chicago, Ill.

YOU can sell our Raincoats. Anyone will buy. We give you one outfit free. Temple Raincoat Co., Box 226, Templeton, Mass.

AGENTS—Sell rich-looking imported 36x68 Rugs, \$1 each. Carter, Tenn., sold 115 in 4 days. Profit, \$57. You can do same. Write for sample offer selling plan; exclusive territory. Sample rug by parcel post prepaid, 98c. Condon Importer, Stonington, Maine.

EASY money, \$5 to \$10 daily, spare time: double if full time; biggest agent's proposition on market! If you fail to write us you pass up the best thing that has ever come your way. Mitchell, Gen. Mgr., 6030 Kenwood Ave., Chicago.

\$2.50 PER day salary paid one man or woman in each town to distribute free circulars and take orders for concentrated flavorings in tubes. Permanent position. J. S. Ziegler Co., 7P East Harrison, Chicago.

AGENTS. Cost, 3c, sell 25c. Gold winning letters. Any one can apply. Samples free. Chicago Letter Co., 848 Altgeld St., Chicago.

YOUR Name on a stencil. Transparent Window Display Sign with a chance to make extra money for 10c. F. Murphy Mfg., 257½ York St., Jersey City, N. J.

USE your spare time to build up a mail-order business of your own. We help you start for a share in profits, 27 opportunities. Particulars free. Opportunities Exchange, Buffalo, N. Y.

DOLLAR an hour, selling gas lighters; lights instantly by thrusting into gas flour. H. & S. Company, Indianapolis, Indiana. Sample 25c.

READ this: Never mind; send address, we'll show you the easiest money ever. King's Mfg. Co., 2 Rector St., N. Y. C.

AGENTS: Make \$5 daily selling 20 dandy Post Cards 10c, 100% profit in quantities. Four sample packages 25c. Baker & Co., 2120 Harrison St., Chicago.

LOCAL Manager Wanted to Appoint Agents and see trade on D-B Products. We have a new sales plan that means quick, profitable sales. The man that is not afraid to work can make an excellent income. If your record will stand rigid investigation send it today—we will be interested. Denley Bros., 7402 Acton Road, Cleveland.

AGENTS Wanted—Agents make 500 per cent profit selling "Novelty Sign Cards." Merchants buy 10 to 100 on sight. 800 varieties. Catalogue free. Sullivan Co., 1234 Van Buren St., Chicago, Ill.

DON'T be an Agent—You take the money; be your own master. Dave Crawford, W. Va., writes: "Made \$42.75 first week." Smith, Pa., writes: "301 in two weeks." Bustwick, N. Y., "Made an average of \$10 a day." We have started hundreds of others. Gray's outfit \$15 and up. Plate Gold, Silver, Nickel, Metal, etc. We furnish recipes, formulas, trade secrets and teach you the art; work easy. Royal new dipping process. Every family, hotel, restaurant, shop has tableware, jewelry, metal goods of all kinds to be plated. Every other business overcrowded, few plating shops. Send postal, free sample plating. Gray & Co., Plating Works, 133 Gray Bldg., Cincinnati, Ohio.

\$50 PAID for one day's work. New, wonderful invention, mechanical wonder; scientific marvel. Tremendous sale staggers country. Over 1,000,000 sold, yet just introduced. Agents banking enormous profits daily. Walters \$50 first day, O'Connell \$40. Everybody wants Grab's 10 blade, adjustable, double action shoe scraper on door-step. Automatically removes mud, snow. Seven new patented features. Territory free, worth fortune. Security Mfg. Co., Dept. 150, Toledo, O.

STOP here and write The Sign Co., Silver Creek, N. Y.

SELL Melco Chemical Tool Marking Outfits. Non-acid. Marks any metal tool. Big profits. Write for agent's proposition. Melco, Box 101, Eaton, Ohio.

AGENTS for Ho-Ho-Co Skin and Scalp Soap, perfumes, toilet articles. Our prices are lower, quality of products better, orders repeat. Rothen, 212 N. Second, St. Louis, Mo.

NEW Electric Novelty. Flashlight, exact size and shape of fountain pen. Sells on sight, \$1. Sample, 75c. Dozen lots, 50c. Ludwig, 71 W. Broadway, New York.

BIGGEST money-maker out. Newly invented "Linefinder and Copy Holder" for stenographers. Greatest time saver. Exclusive territory. Lineguide Mfg. Co., 190 N. 5th Ave., Chicago.

GUARANTEED Hosiery Manufacturer wants man or woman to establish permanent distributing route in home locality. No capital or experience needed. Liberal inducements for all or part time. D. Parker Mills, 2123 No. 12th St., Phila., Pa.

FROM Dance Hall to White Slavery. 400 page, cloth book, illustrated, \$1. Immense sale. Experience unnecessary. Liberal terms. Big money quick. Charles C. Thompson Co., Manufacturing Publishers, 1128 Wabash Ave., Chicago.

RESIDENT managers wanted for all open territory. Opportunity to establish your own permanent business. Must finance orders for complete Le-Ta-Co. household necessities line. Rapid sellers; big repeaters; large profits. The Maher Co., Newark, N. J.

AGENTS—Now is the season to get quick, easy orders for the luxurious, popular-priced "Spray Shower-bath;" it's the real thing, yet sells for \$2 complete; requires only 3-minute demonstration; guaranteed. Get our offer—territorial rights and liberal profit proposition. Smith Co., 12 Broadway, Buffalo, N. Y.

AGENTS with a little mechanical ability can make \$20 per week, selling our Ford Auto Starter and Primer at \$15. They are neat, strong and durable. Thousands in use. Good territory for responsible parties. Also other auto accessories. Gahm & McCormick, Box 2782, Streator, Ill.

AGENTS—\$50 weekly. We manufacture the best needle case made; a wonderful seller: 200% to 500% profit; talking unnecessary; our "Trust Scheme" envelopes do the work; general agents can make \$100 weekly; particulars free; 25c sample outfit for the; buy direct from the factory. Patsy Needle Co., 102 Davis St., W. Somerville, Mass.

RATCHET Sparkplug Wrench; something new; fits them all; \$3.50; best Automobile Specialty; sell on sight. Unity Wrench Co., Geneva, Ill.

AGENTS—200% profit. Wonderful little article. Sells like wildfire. Can be carried in pocket. Write at once for free sample. H. Mathews, 1962 Third St., Dayton, Ohio.

AGENTS: For automobile specialties. Man with automobile preferred. Sales-manager, 635 Woodward Ave., Detroit, Michigan.

AGENTS Wanted Everywhere — Men, women, boys or girls make big money selling the chamois-like duster glove. Nothing like it ever seen before. Sells quickly at sight to homes, offices, stores, hotels, garages. Repeat orders absolutely certain. Send 25c today; get sample salesmanship book, and quantity prices. Recommended by Good Housekeeping Institute. We will prove to you that this is the biggest seller you ever tried or refund your money. Textile Utilities Corporation, Mfgs., 112 West 30th St., New York City.

PERMANENT Jewel Needle. No changing needles; improved tone; \$1. Attachment for Playing Edison Disc, Records with Jewel Needle, \$2. Automatic Stop, \$1. Needle Holder, 50c. Cabinets, Record Albums for Victrolas and Grafonolas. Terms and Territory. Wells Curiosity Shop, 20 S. Second St., Philadelphia, Pa.

SOMETHING new, Clifton's Vacuum Massager for Beautifier, good seller, get territory. Clifton Specialty Co., Buffalo, N. Y.

AGENTS—Brand new specialty Aluminum Triplicate Sauce Pan with detachable handle. Cooks 3 different foods on one burner. Saves gas. Lasts lifetime. \$100 to \$300 per month easy. Send for our catalog of 400 other specialties. American Aluminum Mfg. Co., Div J.10, Lemont, Ill.

\$20 WEEKLY and more easily earned taking orders for our guaranteed trees, shrubs and roses; part or full time; no delivering; no collecting. Charlton Nursery Company, Dept. J, Rochester, N. Y.

\$1,000 PER Man per County. Strange invention startles world—agents amazed. Ten inexperienced men divide \$40,000. Korstad, a farmer, did \$2,200 in 14 days. Schleicher, a minister, \$195 first 12 hours. \$1,200 cold cash made, paid, banked by Stoneman in 30 days; \$15,000 to date. A hot or cold running water bath equipment for any home at only \$6.50. Self-heating. No plumbing or waterworks required. Investigate. Exclusive sale. Credit given. Send no money. Write letter or postal today. Allen Mfg. Co., 4063 Allen Bldg., Toledo, Ohio.

SURPRISING Profits: General Agents wanted in every city to handle our sanitary "Sav-Ice" Cloth. Reduces ice bills half by preventing useless melting in refrigerators. Exclusive rights. Harsh Mfg. Co., Indianapolis, Ind.

\$15 MADE first day by 13-year-old boy with Shomescope. Woman made \$8 first hour. Particulars free. Shomescope Mfg. Co., 523 W. 13th St., Kansas City, Mo.

AGENTS make \$10 a day selling rugs at \$1 each; cost agents 55 cents; sizes 36x48; sell from one to six at every house; something every housewife wants; full size rug for sample, 98 cents by parcel post. Commerce Specialty Co., Commerce, Tex.

YOU Can Sell Kleenol Sanitary Brushes to every housekeeper. Buy direct from the largest manufacturers of wire frame brushes in America, at lowest prices. Several fine localities still open—exclusive sale granted if you open agency now. We furnish everything—no capital required. Kleenol Brush Co., 71 Taylor St., Springfield, Mass.

SELL Dry Goods Remnants. Greatest bargains on earth. Remnant Store Co., Cincinnati, Ohio.

AGENTS make big money taking orders for business and calling cards; outfit and agent's instructions free. Wolverine Co., Jackson, Mich.

"PROTECTING Inventions Before Patent Without Cost," next issue Inventor's Advocate, Advocate Building, 12, Washington, D. C., one year 25c; three months 10c.

MAKE and sell your own goods. Formulas by expert chemists. Manufacturing processes and trade secrets. Formula catalog for stamp. B. Mystic Company, Washington, D. C.

300% PROFIT selling out wonderful sign letters for office windows, store fronts and glass signs; resembles finest gold leaf; easily applied; samples free. Metallic Letter Co., 406 N. Clark St., Chicago.

IDEAL Lamp Filler saves bother filling lamps. Men and women canvassers and agents. Good opportunity to make money. Samples A & B 25c. Harry Otis Mayo, Box A2298, Boston, Mass.

AGENTS—Stamping names on Pocket Key Protectors; sample Check with your name and address, 12c. Stamping Outfits, Emblem Checks, Check Fobs, Name Plates, Hart Mfg. Co., Desk 2, 303 Degraw St., Brooklyn, N. Y.

300 TO 400% Profit to Agents selling our guaranteed U. S. Fire Extinguishers. Tremendous demand. Orders repeat. Exclusive territory to county and district managers. United Mfg. Co., 1508 Oakwood, Toledo, Ohio.

We need one active, reliable person in every community to take orders for our popular mechanical books. You don't have to be a book agent. These books do their own talking. Simply show them. They contain just that sort of information about how to do and make things that every mechanically inclined person is looking for. And they are reasonable in price. We allow you a liberal commission for this pleasant work which you can do during spare time without interfering with your regular occupation. Don't neglect this real opportunity, but write now for full details to Manager Book Dept., Popular Mechanics Magazine, 6 N. Michigan Ave., Chicago.

ENDLESS Neckties — Something new, twelve ties in one; costs no more than old style; man made \$75, three days; woman made \$92, week; write for special agents' offer. Endless Necktie Mfg. Co., Dept. 19, Kansas City, Mo., or Universal Products Co., Toronto, Canada.

SELL Our Attractive Brass Easel Poster Frames to picture theatres, also changeable letter signs for every store; big demand; easy sales; liberal commissions. Newman Manufacturing Company, Cincinnati, Ohio.

JUST show them — The new adjustable floor and wall mops, dustless dusters and sanitary brushes sell themselves. Big line. Big profits. Agents write Silver-Chamberlin Co., Dept. M, Clayton, N. J.

AGENTS: Here's \$50 a week easy! Brand new device! Every housewife enthusiastic, \$1.25 profit on \$2 sale. Wonderful selling plans. Parrin Mfg. Co., Fondulac, Wis.

SAFETY First! Sell our line of Sanitary Twisted Wire Brushes. Big income assured. Exclusive territory given. Goods sell themselves. Households, Offices. Catalogue free. 3 in 1 Brush Co., 105 Beckman Street, New York.

1,000% PROFIT—Prepared Sign Letters. Share co-operative business free. Johnston Co., Quincy, Ill.

YOU can be your own boss with our Key Check Outfit. Good for \$5 a day stamping names on pocket key checks, fobs, etc. Sample check with your name and address, 15 cents. Please Die Works, Dept. M, Winchester, N. H.

STOP Here! Let me start you in a home business that will bring you money every day. Experience unnecessary. Spare time. No canvassing. I furnish everything. Send for proofs. Voorhees, Desk C. H., Omaha, Neb.

BIG Profits for You! Manufacture Barley Crisp. New Confection. 5c package costs you 1c. Machine, instructions complete \$7.50 prepaid. Send 10c for samples. Barley Crisp Co., 1205 Broadway, San Francisco.

EASY pleasant work for Mechanics, Shop Men, Clerks, during spare hours, will add many dollars to their salaries. Also want persons who can give full time. Big wages assured. Novelty Cutlery Co., 67 Bar St., Canton, Ohio.

AGENTS make \$100 monthly selling our 500 handy household articles. Catalogue free. Scheff Company, Des Moines, Ia.

OUTFIT Free to Agents. Best selling Handkerchiefs, Dress Goods and Fancy Goods on the market. Quick sellers, big profits. Deal direct with a large manufacturer. Send stamp for particulars. Freeport Mfg. Co., 59 Main St., Brooklyn, New York.

MEDALLIONS—300% profit. Make up your own goods and be independent. Catalogue free. Resag Co., 1205 Randolph St., Chicago.

MAIL-ORDER Opportunities: 25 new Propositions. No competition! Make 95c profit on dollar order; complete outfit 10c. Mail Dealers Wholesale House, 521 Franklin Bldg., Chicago.

AGENTS make \$5 to \$10 a day on the start. Atkinson writes: "The best proposition I have found in my forty years' canvassing." Permanent work. Household necessity. Saving 80%. Write today for General or Local Agents terms. Free sample. C. H. Stuart & Co., 16 Union St., Newark, New York.

AGENTS—\$ daily selling our Handy Tool, 12 articles in one. Lightning seller. Sample free. Thomas Mfg. Company, 482 Third St., Dayton, Ohio.

AGENTS—Great opportunity to be permanent representative largest manufacturers high-grade soaps and toilet goods. \$25-\$75 weekly. Write for immediate appointment. E. M. Davis Co., R. 64, Davis Bldg., Chicago.

YOU can make \$100 as our general or local agent. Household necessity; saves 80 per cent; permanent business; exclusive territory; salary or commission; free sample; credit. J. Pitkin, 113 Midd St., Newark, N. Y.

AGENTS of ability and high character wanted on a new household article. Over 100 per cent profit. Special selling plan that pulls results. Address Merritt & Brock, 59 to 69 Temple Place, Boston, Mass.

AGENTS Wanted for a new Duplicator. Sells to every business man. Fisher Company, 113 Amsterdam Avenue, New York City.

SALES MEN WANTED

SALESMAN wanted in every county in U. S. to sell Motorade. Will positively remove carbon and if used in gasoline will keep motor free from carbon; also gives 15 to 40% more mileage. Purely an oil product, cannot injure finest mechanism. Absolute necessity for auto owners. Big money for salesman. Good chance for right man as partner. Price prepaid \$2.50 per gallon. Money-back guarantee. Address, Motorade, Oskaloosa, Iowa.

MANUFACTURER of international reputation desires representation in this locality. Five established products. Can be sold to retailers, jobbers and large consumers. Permanent money-making business assured by re-orders. Must be able to finance himself sixty days. Box 190, Station C, Cleveland, Ohio.

\$130 HAS been earned in 3 days by our representatives, some even better, introducing our new advertising method which solves the advertising problem for merchants in smaller cities and towns. If you are or want to be a salesman I will show you how to build up a big profitable repeat business quick. Whole or part time. Big money if you act now. Write Salesmanager, Winslow Cabot Company, 61 Congress Bldg., Boston, Mass.

SALESMEN are making big money handling our changeable electric flashing window signs. Get our proposition now, with valuable exclusive territory. Teledesign Company, 6 North Clark St., Chicago.

SALESMEN to sell sliding casters; good side line article; salesmen handling others also write; send 10c covering cost of mailing samples. Weston Co., Arlington, N. J.

GREAT opportunity for general agents selling new specialty to merchants; retailing \$5, \$10, \$15 each. Your profit 200%. No competition. Exclusive territory. Free samples. Sayers Co., 408 Olive Street, St. Louis, Mo.

SALESMEN: Large Chicago Organization wants Specialty Salesmen. Also Side Line men. Handsome commissions on every sale. Pocket samples. State territory desired and present or past connections. Confidential. Merchants Advertising Service, 716 Medinah Bldg., Chicago.

SALESMEN—Agents: Competition killed. Electric Flashing sign; over 36 different display arrangements possible with 210 three and six inch letter combinations—in colors. 30-inch model \$10. Samples to producers. Multiform, 367 Manhattan Bldg., Chicago.

WANTED—Live salesmen with references, capable of selling Collection Cabinets to business and professional men. Good money proposition. Ye Clark Stationery Shop, Syracuse, N. Y.

SALESMEN—We have some excellent territory open to salesmen of ability. This is a proposition that appeals to the best class of concerns. Sales are easy and your profits large. Write us today for catalogue P. M., covering the Schick All-Steel Paper Haler, Davenport Mfg. Company, Davenport, Iowa.

ENGINEERS, draughtsmen to sell Winslow direct-reading beam and reinforced concrete calculating Slide-Rules. Fine opportunity for one agent in each city. H. W. Tomlinson, 64 E. Van Buren St., Chicago.

SALESMEN: Monarch interchangeable all metal signs, size 14x18 inch cost you \$1.85; 14x28 inch at \$3.25; largest supply of all metal letters. Changeable electric flasher sign, 30 inch model at \$2.75. Monarch Mfg. Company, 416 S. Franklin St., Chicago.

WANTED—Representatives everywhere. Exclusive territory. Gold sign letters for stores and office windows. Any one can put on. Write today for free sample. Metallic Letter Co., 483 N. Clark St., Chicago.

TRAVELING Salesmen Wanted—Experience unnecessary. Earn big pay while you learn by mail during spare time; only eight weeks' time required, one or two hours a day. Steady position, easy work, hundreds of good positions to select from. Write today for free book, "A Knight of the Grip," containing full particulars and testimonials from hundreds of students we have recently placed in good positions and who are earning \$100 to \$300 per month. Address Dept. B-16, National Salesmen Training Association, Chicago, New York, Kansas City, San Francisco.

SALESMEN—Get our plan for Monogramming Automobiles and Motorcycles by transfer method. Very large profits. Motorists' Accessories Co., Ashland, O.

HELP WANTED

DRAFTSMEN—Get a higher salary. Topographic Drafting pays from \$1,200 to \$1,800 and up. Big field. Learn Topographic in short time under our instruction. Get full particulars. Columbia School of Drafting, McSchenk Bldg., Washington.

LEARN automobile repairing, driving, on up-to-date cars; also electricity. Room and board while learning; many positions secured; satisfaction guaranteed; catalog free. National School of Engineering, 2110 W. 7th, Los Angeles. Established 1903.

MEN and Women Over 18 Wanted—\$65.00 to \$150 month. U. S. Government life jobs. Common education. Write immediately for list of positions open to you. Franklin Institute, Dept. S-21, Rochester, N. Y.

MEN, 18-40, become Railway Detectives. Experience unnecessary. Stamp for particulars. Brouk, 1321 Ave. A, New York.

PLEASANT spare-time work; mailing circulars. Good pay. No scheme. Details free. Home Pub. Society, 46 N. 12th, Philadelphia.

WANTED—Distributors of advertising matter everywhere. Send 10c for Application Contract. Sample Magazine (None Free). Barkley's Distributing Agency, (403) Mount Pleasant, Pennsylvania.

MAKE \$50.00 monthly furnishing commercial reports; no canvassing, good opportunity; cooperative offer free. "Cico," P. M. C., Peru, Ind.

SILVERING mirrors. Plating tableware, auto-brass. Home booklet plans free. Clarence Sprinkle, Dept. 28, Marion, Ind.

DISTRIBUTORS Wanted—Good pay; steady work; giving away packages. Perfumed Boxed Soap Powder with our Soaps, etc. No capital or experience needed. S. Ward & Co., 218 Institute Pl., Chicago.

PEND SPEND summer gathering insects, butterflies. I pay big prices. Many worth \$5.00, \$10.00. All salable. Men. Women. Get instructions, price-list, pictures, descriptions of valuable ones. Send stamp. Sinclair, 1244, D-6, Los Angeles, Cal.

\$18.00 WEEK. Become Chauffeurs. Earn while learning. Sample lesson free. Franklin Institute, Dept. S-302, Rochester, N. Y.

FREE Instruction. Learn Bookkeeping, shorthand, letter writing, rapid calculation, banking. Our booklet tells how we teach you free and prepare you to get a better position with a higher salary. Make a start today, write for our free booklet. Commercial Correspondence Schools, 303 School Bldg., Rochester, N. Y.

DETECTIVES earn from \$25 to \$100 per week and traveling expenses. We show you how. Write National School of Detectives, Room 516, 489 Fifth Avenue, New York.

RAILWAY Mail Clerks Wanted. Commence \$75.00 month. Sample examination questions free. Franklin Institute, Dept. S-21, Rochester, N. Y.

FREE Illustrated Book tells of about 300,000 protected positions in U. S. service. Thousands of vacancies every year. There is a big chance here for you, sure and generous pay, lifetime employment. Just ask for booklet S-29. No obligation. Earl Hopkins, Washington, D. C.

OWN a business. Co-operate with me evenings at home. Everything furnished. Don't worry about capital. Boyd H. Brown, Dept. K-5, Omaha, Neb.

JOIN an Order that pays money instead of charging dues. Sollicitors wanted. Chas. Strong, Ward, Colorado.

GET a Government Job. See ad on page 16. Write now—today! Patterson Civil Service School, Rochester, N. Y.

MEN—Women—Wanted—Government Jobs. \$65.00 to \$150.00 month. Write for list positions now obtainable. Franklin Institute, Dept. S-21, Rochester, N. Y.

MEN to refinish lighting fixtures, brass beds, etc. All or spare time. No capital or canvassing. Experience unnecessary. Information free. Gummetal Co., Dept. G, Decatur, Ill.

WRITE Moving-Picture Plays; \$50 each. Correspondence course unnecessary. Details free. Atlas Publishing Co., 3045, Cincinnati.

THOUSANDS Government Jobs now obtainable. List free. Franklin Institute, Dept S-21, Rochester, N. Y.

USE your spare time to build up a mail-order business of your own. We help you start for a share in profits. 27 opportunities. Particulars free. Opportunities Exchange, Buffalo, N. Y.

A MONEY Proposition—Co-operate with me in a profit-sharing mail-order business. Will place trial advertisement, furnish printed matter, goods to all orders and divide the profits. Particulars. Desk 133, Hazel A. Horton, Tokosha, Mich.

AMBITIOUS Men Women, 18 or over, wanted. Government Jobs, \$45.00 to \$150.00 month. Full list of positions now obtainable free. Franklin Institute, Dept S-21, Rochester, N. Y.

SALESMEN, Agents, everywhere: New auto fuel. Permanent, profitable. Tankin Chemical Sales Co., Cleveland, Ohio.

ABLE-BODIED Men for firemen, brakemen, on all railroads, \$120 monthly. Experience unnecessary. Railway Association, Dept. 298, Brooklyn, N. Y.

WANTED—Men. Become Railway Mail Clerks. Commence \$75 month. For particulars write immediately. Franklin Institute, Dept S-21, Rochester, N. Y.

FIREMEN and Brakemen; \$100 monthly; experience unnecessary; hundreds needed by the best railroads everywhere; particulars free. 810 Railway Bureau, E. St. Louis, Ill.

BOYS and Girls—Vacation money earned by working one hour a day. Send 10¢ to cover cost of handling and postage and I will send free sample and full instructions. S. S. Holden, 651 Railway Exchange Bldg., Chicago.

TELL Your Boy About This! Boys, you can make big money each month selling The Boys' Magazine. Send no money. Write us today for 10 copies. All unsold copies can be returned. The Boys' Magazine, Dept. A-89, Smethport, Pa.

HUSTLERS everywhere \$25 week operating Lawn Mower Sharpener, 50% paid. Send four references and 25¢ with reply. Sharpener and instructions sent prepaid. D. Short Co., Columbus, Ohio.

CANVASSERS—Make from \$5.00 to \$10.00 a day selling our guaranteed line of Flavors, Soaps, and Toilet Articles. Permanent occupation. J. M. Hampton, S. C., says: "Made repeat sales of \$3.00 to one family, \$3.85 to another; profit \$4.10. Time, 1 hour." Active agents make big money. National Company, Newark, New York.

SALESMEN: Crackerjack, \$5 check protectors; also useful advertising and self-selling specialties; liberal commissions. Dering, #1 Weehawken, N. J.

BE a Detective—Earn from \$150.00 to \$300.00 per month. Travel over the world. Write C. T. Ludwig, 310 Westover Building, Kansas City, Mo.

STOP Here! Let me start you in a home business that will bring you money every day. Experience unnecessary. Spare time. No canvassing. I furnish everything. Send for proofs. Voorhees, Desk C. R., Omaha, Neb.

WANTED—An Ideal! Who can think of some simple thing to patent? Protect your ideas; they may bring you wealth. Write for "Needed Investments" and "How to Get Your Patent and Your Money." Randolph & Co., Patent Attorneys, Dept. 144, Washington, D. C.

GO on the Stage. Vaudville career offered you. Experience unnecessary. Managers endorse my method. Instructive vaudville book free. Write today. Fredric LaBelle, Sta. 10, Jackson, Mich.

GOVERNMENT Examinations. Most thorough preparation, \$5; returned if not appointed; particulars free. American Civil Service School, Washington, D. C.

BE a detective. Earn big money. Write John J. Gillis, Licensed and Bonded N. Y. State Detective, Retired Member N. Y. Police Dept., 22 years experience, 254 Huguenot St., New Rochelle, N. Y. Investigation solicited.

BE a Detective. Earn \$150 to \$300 monthly. Travel over the world. Write American School of Criminology, Dept. F, Detroit, Michigan.

FOR SALE

WILL sacrifice absolutely high-class violin for \$15, including case and bow. Will send C. O. D. on inspection. Splendid chance to secure valuable violin cheap. Inquire, "Professional," 802 Market Street, McKeenport, Pa.

OLD Coins. Write to Heinz, Numismatic Bank, West Salem, Ohio.

BARGAINS—Gasoline Blowtorch, \$2.00 value, 85¢ postpaid. Bicycle Gas Lamp, value \$2.25, postpaid 90¢. Anything, everything at cut prices. Literature free. House of Bargains, Box 323, Huntsville, Ala.

TYPEWRITER, good as new, \$15.00. Adams, 108 S. 15th St., K. C. Kan.

MOTORCYCLES, \$20 up. Hall & Graumann, Atlantic City, N. J.

FOR SALE—Case Engine, Reeves Separator. Six Bottom Reeves Plow, nearly new, cheap. E. F. Hinck, Farmington, Minn.

34-H. P. Commercial Vacuum Cleaner; will sell cheap or exchange for high-speed motorboat. F. Huddy, Ann Arbor, Mich.

FIELD, Marine, Day and Night Glasses with beautiful case, 25-mile adjustment, \$30 value, only \$6.50. Money back if not satisfied. Wells Curiosity Shop, 29 S. Second St., Philadelphia, Pa.

FOR SALE—13 hp. L. H. C. gas tractor. Cost \$1,300. Will take \$700 cash. Elmer Detmers, Hopelde, Ill.

VACUUM cleaner pumps and parts for assembling, save 75%. Vacuum Supply Co., Ann Arbor, Mich.

SALE OR EXCHANGE

GOOD as new Electric Piano Player, Writerpress, Dictaphone, stamp affixer. Have all kinds machines and personal property to sell or exchange—make offers. Jos. Weller, Olney, Ill.

WRITE for my bargains in typewriters, cameras, guns, books, office devices, city lots, etc. Hartman, Moline, Illinois.

DRAFTING instruments wanted; have new kodak, case and complete outfit. Jack Murray, Lewis House, Rockford, Ill.

GUNS, SPORTING GOODS, ETC.

TWITCHELL'S Gun Paste for polishing old rusty or pitted guns. Will not injure or scratch the finest barrels. Box with directions, postpaid, 25c. Orris Twitchell, West Milan, N. H.

FIREARMS—Old-time and modern. Buy, sell, exchange all sorts. Stephen Van Rensselaer, West Orange, New Jersey.

FLOUR & FEED MILLING MACHINERY

SPECIAL bargains in second hand Attrition mills, burr mills, crushers, corn shellers, bran dusters, dust collectors, purifiers, reels, double, single, 2 and 3-pair high roller mills, sieve bolters, receiving separators, scourers, etc. Write for description and prices. Sprout, Waldron & Co., P. O. Box 429, Muncy, Pa.

MACHINERY, TOOLS AND SUPPLIES

BELTING—all kinds—rebuilt and new. Everything in Belts. Power Transmission. F. Hamill Co., Grand Rapids, Mich.

16"x8" **FORSAITH** screw-cutting lathe, power cross feed, chuck, \$150. Western Machinery Co., Cincinnati, Ohio.

REBUILT Lathes, Drill Presses, Milling Machine, Universal Wood-Workers, Saws, Jointers, etc. Voennegut Machinery Co., Indianapolis, Ind.

HACK Saw and Power Blades, all sizes and points, low prices. Radio Co., 320-13 West New York, New Jersey.

PULLEYS, Gears, Sprockets, Shafting, Hangers; see page 149. W. A. Jones Foundry & Machine Co., Chicago.

MARK Your Tools. All kinds of steel letter stamps, trade marks, etc., made to order. Your name, \$1; three initial, 5¢. Gideon Pike, Atleboro, Mass.

2 **BERKSHIRE** Molding Machines in fine shape. A bargain. P. O. Box 1323, Columbus, O.

REBUILT Leather Belting, half price—new—equal quality; less stretch, equal service. Less price, cheap, new, better service. All sizes, guaranteed. New leather, rubber, canvas, factory prices. Agents wanted. Friedrich Belting Co., Manufacturer, St. Louis, Mo.

5,000 FEET good 2" leather belt, 10¢ a foot. Lucas & Son, Bridgeport, Ct.

SECOND Hand Lathes, 13 inch and 15 inch for sale. Bargain; both good condition; were taken in exchange. South Bend Machine Co., 627 E. Madison St., South Bend, Ind.

VACUUM Pumps and Cleaners, all sizes, complete outfit. Thurman Vacuum Cleaner Co., Manufacturers, Dept. O, St. Louis, U. S. A.

FOR SALE—All sizes new and second-hand Pulleys, Belting, Shifting, Hangers, Couplings, Pillow Blocks, Collars, etc. Passman Bros., 28 and 30 So. Green Street, Chicago, Ill.

VACUUM cleaner pumps, tools, etc., for stationary house or wagon outfit. Vacuum Supply Co., Ann Arbor, Mich.

FOR SALE—25 Lincoln milling machines, \$25 to \$100 each. Lucas & Son, Bridgeport, Conn.

HAVE for sale several sizes of lathes, milling machines, drill presses, punch presses, shapers, planers, boilers, steam engines, oil, gas and gasoline engines and wood-working machinery. Planer, 122 Water St., New York, N. Y.

ENGINE Lathe, swings 9½ in., takes 25 in. between centers. Complete set gears cutting all size threads 3 in. to 40 in., \$43.50. Grammes & Sons, Allentown, Pa.

FOR SALE—5 good Engine lathes, 16" to 32"; size wanted. Lucas & Son, Bridgeport, Conn.

JUST Published—Popular Mechanics Shop Notes for 1915—626 Easy Ways to do Hard Things. This is Vol. XI and is similar in style to the other numbers in the series. 224 pages, 517 illustrations. Paper 50 cents. Cloth, \$1, postpaid. Popular Mechanics Book Dept., 6 N. Michigan Ave., Chicago.

ENGINES, MOTORS AND DYNAMOS

BARGAINS Gas, Gasoline or Kerosene Engines. Brand New. Never Uncrated and with Mfr's. Guarantee on Them. 1½ hp., \$25; 2½ hp., \$52; 5 hp., \$77; 7 hp., \$100; 9 hp., \$147; 12 hp., \$185. Write for price on the lot or any part. Ship from Indiana, H. O. Ewing, Fort Pierce, Fla.

FOR SALE Elbridge engine, 27 hp., 3-cylinder, 2-cycle (almost outfit), complete outfit. Stubbs, 818 Granite Building, Rochester, N. Y.

FOR SALE—15 hp., 2-cylinder Nash gasoline engine, magneto \$225.00, excellent condition. Lucas & Son, Bridgeport, Conn.

LOW voltage generators, W. W. Stuart, Des Moines, Ia.

ALTERNATING current, single-phase motors, \$6 to \$95. Direct current and three-phase bargains. Motors bought, sold, repaired. Satisfaction guaranteed or money refunded. Send for electrical supply catalog list. Hyre Electric Co., 613-E, So. Dearborn St., Chicago.

FOR SALE Steam and Gas Engine, Jackson Mfg. Co., Fremont, Ohio.

KERMATH—12 hp., 4-cycle, 4-cylinder marine engine, factory overhauled, guaranteed first-class condition in every way, with magneto and carburetor, complete, \$165. Kermath Mfg. Co., Detroit.

GENERATORS, Batteries, \$2; Lamps, 6-v. up, 25¢. Meters, Engines, Compressors, Supplies. List Free. Box 281, Chicago.

MOTORS, New Holtzer-Cabot, Alternating Current, ½ hp., \$8.50 each. H. G. Crane, Brookline, Mass.

SMALL A. C. Motors—110 volts—60-cycle—single phase—guaranteed new—automatic start—1-½ H. P., \$14.00; ¼ H. P., \$3.50; ½ H. P., \$5.00. Others smaller. Johnson, 98 Evans Ave., Ingram, Pa.

FOR SALE—Engine, 125 H. P., with direct connected Generator, 75 K. W., 110 volts, perfect condition. R. J. Kilridge & Co., Green and Superior Sts., Chicago, Ill.

FOR SALE—Reversible rowboat motor, first-class condition, with magneto, \$50. X Y Z, 78 E. Madison St., 9th floor, Chicago.

ENGINES and Parts for Sale—45 Hp. Standard-Dayton \$160. Studebaker 35 Hp. \$85. Oswald 25 Hp. \$80. Presto, B size, \$10; Ford Eng. \$100. Studebaker-Garford parts, models 10-F and 14 Buick parts, D. U. 4 Bosch magneto, \$27.50. Auto Salvage Co., 1438 Wabash Ave., Chicago, Ill.

FRANKLIN air-cooled engine, transmission, carburetor, coil, \$40.00. G. French, Melrose Highlands, Mass.

FOR SALE—½ H. P. Direct Current Dynamo, 1-in. H. P. Motor. Robert Bersler, Malvern, Penna.

SPECIAL Sale—Low-voltage generators— 10 lights—110 volts—\$12.50; 30 lights—40 volts—\$32.50; 40 lights—50 volts—\$35.00. Other sizes, different voltages, less than half price. Johnston, Evans Ave., Ingram, Pa.

ONE 2-cyl. steam auto engine and boiler complete, \$25. Clare W. Webber, Independence, Iowa.

MARINE motors—\$97.50, four cylinder, four cycle, high speed. Powerful enough for a thirty-foot boat, a "crackerjack" for a speed boat. 2,500 this year permits price. Tribune Engineering Co., Marine Dept., Oregon, N. Y.

10 H. P. Alamo Oil Engine. Never used. A bargain, 15 H. P. Fairbanks & Morse Gas Engine. Fine shape. Cheap. P. O. Box 1325, Columbus, O.

FOR Sale—Second-hand 1912 Sterling Engine, 18-25, 4-cylinder, fully equipped, first-class condition. Stubbs, 818 Granite Bldg., Rochester, N. Y.

BARGAINS in Rebuilt Stationary Gasoline Engines. These are our own engines taken in exchange and rebuilt good as new. 1½ to 12 H. P. \$20 up. Write for description. State size wanted. Sta-Rite Engine Co., La Crosse, Wis.

FOR Sale—Gasoline engines, automobiles, marine and stationary, also castings. Second-hand ones taken in exchange and for sale. Apply with stamps. B. W. Richardson, R. No. 36, Peoria, Ill.

REBUILT Engines. We have on hand a number of rebuilt "Buffalo" engines, guaranteed, at greatly reduced prices. Write for bargain list. Buffalo Gasoline Motor Co., 1293-1305 Niagara Street, Buffalo, N. Y.

JUST Issued—Amateur Mechanics No. 6. Another great book of 293 articles for those who like to make things. Similar in style to the other numbers in the series. 128 pages, 261 illustrations. Paper. Price 25 cents postpaid. Popular Mechanics Book Dept., 6 N. Michigan Ave., Chicago.

ENGINE CASTINGS AND BLUE PRINTS

FOR Sale—Castings for two-cycle engines. 10 H. P. marine engines \$65.00. Richards Iron Works, Manitowoc, Wis.

CASTINGS for small stationary gasoline engines, with drawings. R. H. Bowersox, Hanover, Pa.

GASOLINE Engine Castings, with drawings. Cheap. Catalog for stamp. Novelty Manufacturing Co., 353 West 6th St., Cincinnati, Ohio.

BOATS, LAUNCHES, ACCESSORIES

PALMER Motors and Launches, two to fifty horsepower, two and four cycle. Get our 1913 reduced prices. Catalog free. Palmer Bros., Cos Cob, Conn.

FOR Sale—Semi-speed launch, 27 ft. by 4 ft. 6 in. Trebert, 40 hp., fully equipped, splendid condition, speed twenty-two miles. Stubbs, 818 Granite Bldg., Rochester, N. Y.

MOTORCRAFT Encyclopedia—A 150-page book that tells 1001 things every motor boatman should know. How to overcome engine troubles. Price \$1, postpaid. Popular Mechanics Book Dept., 6 N. Michigan Ave., Chicago.

FOR THE SHOP

FOR That Boy—He will appreciate a copy of the boy's book "The Boy Mechanic" that tells about 700 different things for boys to do and has 800 pictures. 480 (7x10) pages, cloth, big, handsome book for the price, \$1.50 postpaid. Popular Mechanics Book Dept., 6 N. Michigan Ave., Chicago.

BLACKSMITHS

BLACKSMITHS, get out of the rut; be progressive. Get Toy's modern methods of doing hard jobs easy. Make solid welds. Temper all tools to a standard with Toy's Colored Tempering Charts. Do the job the other smith can't do. All for \$1. Send for free samples. W. M. Toy, Sidney, Ohio.

SHOP Notes—Many valuable kinks for blacksmiths are contained in our series of Shop Notes books. 10 volumes, 50¢ each, postpaid, or \$5 per set prepaid. Popular Mechanics Book Dept., 6 N. Michigan Ave., Chicago.

CEMENT

IF you want the best information on cement and concrete construction, subscribe for Concrete-Cement Age, leading cement and concrete monthly. Sample copy, 10 cents. Yearly subscription, \$1.50. Concrete-Cement Age, 135 Newberry Bldg., Detroit, Mich.

CONCRETE Building Block Machines and Molds; free catalogue. 5 Market St., St. Louis, Mo.

ELECTRICAL

"FOUNTAINLIGHT"—a flashlight resembling a fountain pen. Useful. Durable. \$1 complete. Sinclair, 199 Mount Prospect Avenue, Newark, N. J.

ELECTRIC Fans. D. C. \$3. A. C. \$3.50, with cord and plug. Edgar Philip, 197 Field Ave., Detroit, Mich., for Bargains.

HOME Electric Candle, with Tungsten Bulb, Nickel finish, postpaid, 6c. "Fits any standard battery." E-H Electric Co., 146 Hansford Bldg., San Francisco.

40-WATT Lamps, 25¢ each. Any quantity. Genuine drawn wire filament. Other types and sizes at lowest prices. Buy direct from factory. Save 25 per cent. Norwood Lamp Works, Box 29, Cleveland, Ohio.

"AMATEUR Electrician." Make Batteries, Dynamos, Motors, Electric Engine, Telephone, etc. 75 Illustrations, 10c. Renew Dry Batteries, 3 guaranteed processes, 20c. Both, 25c. Novelty Shop, 3311-E, Belleplaine Ave., Chicago.

RENEW Old Dry Batteries. Instructions (20c) Guaranteed. Williamack, Gramplan, Pa.

TESLA Coil, 12-inch spark. For wireless or X-ray. Good condition. For sale cheap. Ross Whittier, Athorpe House, Cambridge, Mass.

STAMP COLLECTING

FOREIGN Stamps Free; 52 different foreigns, including China and Venezuela, to all who apply for our high grade approval selections. Send two-cent stamp for return postage. Edgewood Stamp Co., Dept. H, Milford, Conn.

OLD Canada packet free—Early issues. Maps, Jubilees, Tercentenaries, Dues, Maple Leaves, etc. Postage 2c. Superb 50% approvals. Midland Stamp Company, Midland, Ontario.

FREE—Choose one. 205 foreign, 101 United States, 50 Sweden, 50 Asiatic, 50 Norway-Denmark, all different, with McKele's Stamp Weekly, Boston, Mass., six months. Remit 25c.

APPROVALS: desirable stamps on approval at low prices. Reference required. G. V. Lowering, 2715 Thirteenth St., N. W., Washington, D. C.

FREE! Fifteen Austrian Jubilee stamps for requesting 1c approvals. F. Riedell, Schenectady, N. Y.

STAMPS Free! 50 different, including unused Provisional Swiss (Just Out). Send 4c postage; mention gift F-76. Bright & Son, 164 Strand, London, England.

STAMPS—10c. China, etc., stamp dictionary and list. 2c. Bullard, Sta. A. Boston.

104 DIFFERENT stamps, including United States 1861 Civil War, Japan, Argentine, etc. Large price list and sample New England Stamp Monthly, only 5c. Finest approval sheets, 50% discount. New England Stamp Company, 19 Washington Bldg., Boston.

STAMPS, 1,000 mixed, 13c. 500 different Foreign. 60c. Western Stamp Co., Omaha, Neb.

STAMP ALBUM with 538 genuine Stamps, incl. Old Mexico, Malay (tiger), China (dragons), Tasmania (landscape), Jamaica (waterfalls), etc., etc. 10c. 100 diff. Jap. N. Z. etc., etc. Big List, Coupons, etc. FREE! W. E. Stamps. Hussman Stamp Co., St. Louis, Mo.

STAMP Collectors! Free! Not a cheap packet, but something worth asking for. Your name and address on post card will do. Wm. Roland, 549 East Decatur St., Decatur, Ill.

STAMPS—On approval. U. S. postage, revenue, and department. Business reference necessary. Mrs. L. Kellogg, West Hartford, Conn.

STAMPS sent on approval at 70% discount. Foreign Revenues, 3c each. Reference required. Emory Renfau, Hanover, Penna.

HOW to earn a 25c and a 50c California gold coin as token. Send 2c stamp. Coin Exchange, New Rochelle, N. Y.

1 VARIETIES Bolivia, 1894. Free to Approval Applicants, enclosing 4c postage. Roberts Scopes, Quakertown, Pa.

1,000 OLD U. S. stamps and 200 different foreign stamps, 25c. F. L. Toupal Co., Chicago Heights, Ill.

FREE—100 stamps, including Japan, Queensland, etc. Head, 302 Park Place, Milwaukee, Wis.

50 VAR. So. America, 10c. Weed Stamp Co., Centreville, Mich.

LOW priced approvals. Mention paper and receive unused Department Stamp Free. S. E. Colman, 634 Keefer Place, Washington, D. C.

WATERMARK Detector and fifty different stamps, ten cents. Bert McCann, Kirksville, Missouri.

STAMP Collectors—\$2 premium coupon, big 1915 price list, Monthly Bargain Lists, etc., free. No unsolicited approvals. W. C. Phillips & Co., Glastonbury, Conn.

1,000 STAMPS from 30 countries, 12c. Edward Lufbery, Wallingford, Conn.

STAMPS, 100, all different, free. Postage 2c. Mention paper. Quaker Stamp Co., Toledo, Ohio.

24 VARIETIES Cuban stamps, 10 cents. List of 6,000 low-priced stamps free. Chambers Stamp Co., 411 P. Nassau St., New York City.

PACKET of 23 stamps; no two countries alike, 500 hinges. Set of \$1 and \$2 U. S. Rev., all for 5c. Mention paper. Miami Stamp Co., Toledo, Ohio.

25 DIFFERENT British Colonials to applicants for stamps on approval who send 2c postage. Nickles, 122 Florida Ave., Washington, D. C.

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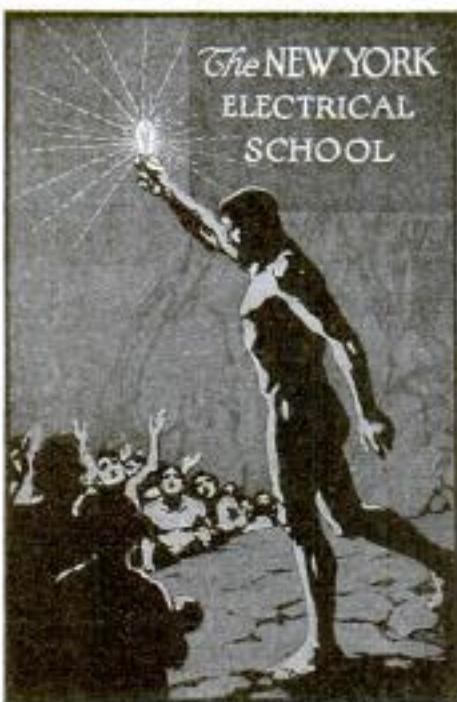
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If you are over 17 and under 25, an American citizen of good health and habits, it will pay you to look into the Navy's offer.

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Vol. 23

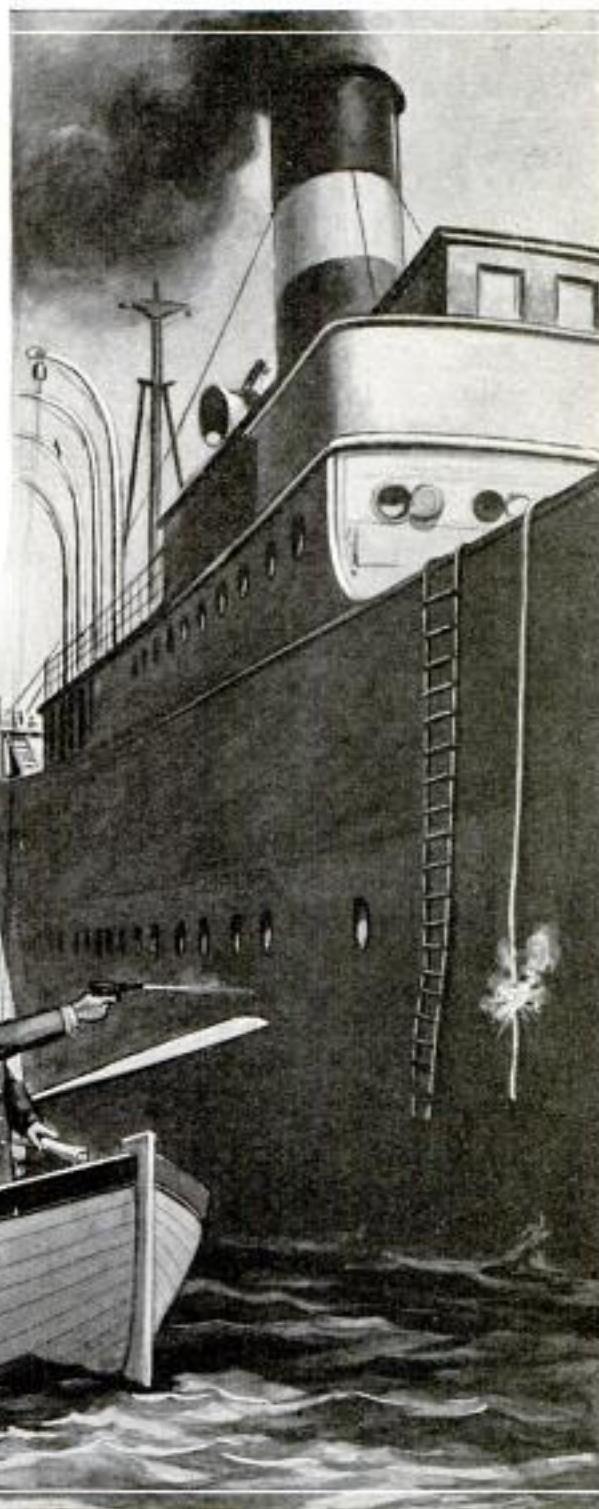
MAY, 1915

No. 5

Firing the Fuse to Blow Up a Steamer

THE sinking of British merchant ships by German submarines has not been by means of torpedoes, for the most part, but by bombs or mines placed in the captured vessel's hold and exploded by fuses which are lighted as the last boatload of the crew leaves the ship. Torpedoes are too expensive to waste where not necessary.

When the "Ben Cruachan," a cargo steamer, was halted at sea by a submarine, the crew was given 10 minutes to leave the vessel. An officer from the submarine then went on board with a bomb, leaving the long fuse trailing over the side. After the captain had gathered up the ship's papers and embarked in the boat, the German officer lighted the fuse by firing his automatic pistol, and the boat was rowed



How Merchant Ships are Destroyed in War: Firing the Fuse of a Bomb by the Flash of an Automatic Pistol

quickly away. The officer returned on board the submarine, which disappeared, while the crew of the "Ben Cruachan" rowed toward some fishing craft a few miles distant. The doomed ship blew up and sank in a few minutes.

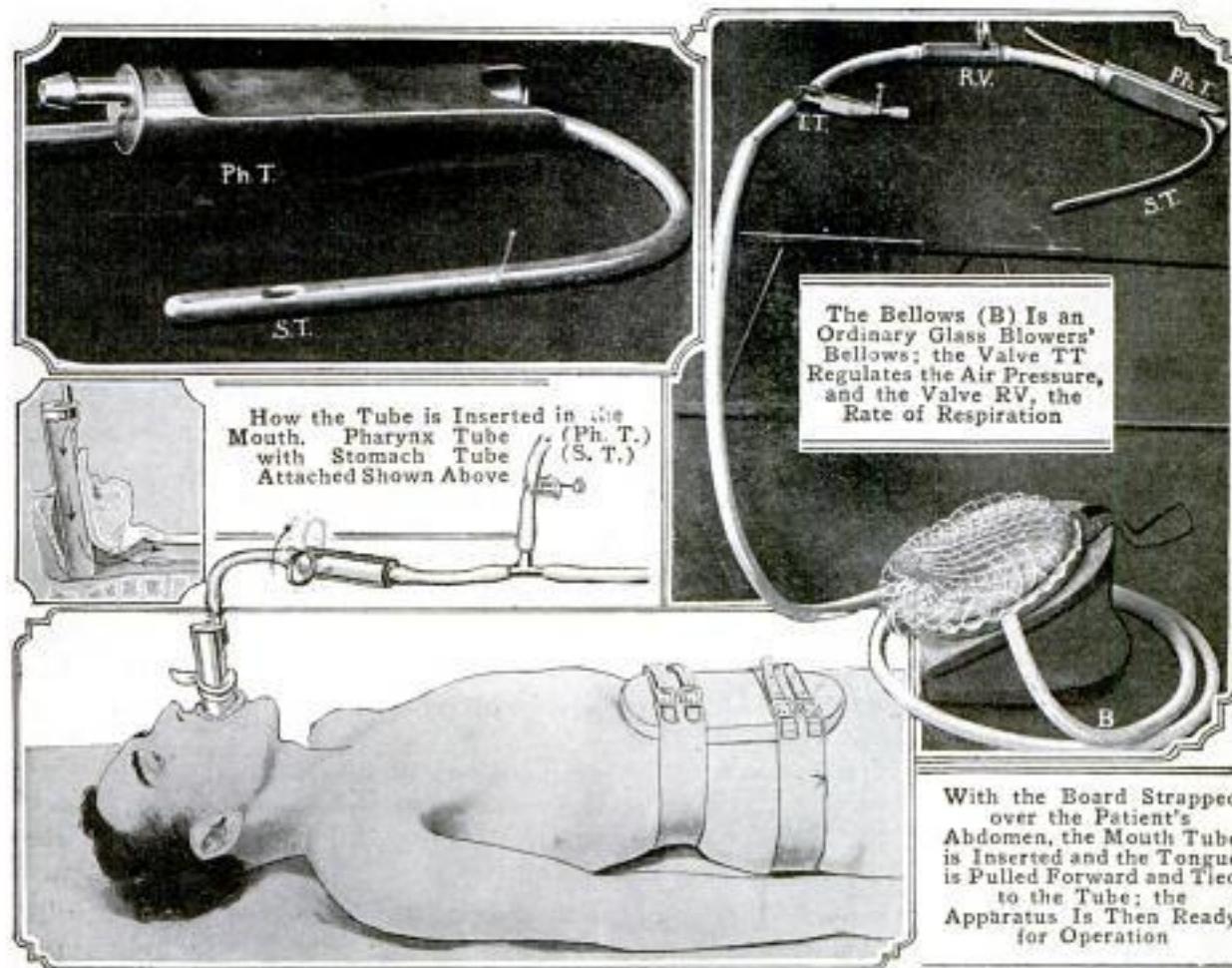
RESPIRATION DEVICE FOR TETANUS TREATMENT

In connection with the treatment of tetanus or lockjaw, a disease that has proved to be the greatest menace of all to soldiers wounded in the European war, an apparatus has been developed which is apparently certain to come into general use in cases where it is necessary to resort to artificial respiration. This apparatus is not used in the treatment of tetanus, but in preventing one of the medicines used in the treatment from proving fatal. Tetanus can only be treated successfully by means of antitetanus serum. It takes this serum several hours to act and in the meantime the victim is in danger of dying from the violent convulsions that accompany the disease. To provide relief from the convulsions and thus keep the victim alive until the serum has time to act, a solution of epsom salts injected under the skin, into a vein, or into the mucous membrane of the spinal column, is used, the latter method being imperative if the disease has reached a violent stage. This simple remedy stops the convulsions, but it also causes so complete a relaxation of the muscles that there is danger that the lung muscles will cease to act and the victim will die of suffocation. The new apparatus is designed to produce and maintain artificial respiration until the muscles begin to act normally, and thus make it possible to give as much of the epsom salts as may be necessary.

This Vehicle,
Equipped with
Pontoon and
Driven by an Aerial
Propeller, is Used
for Transporting
Passengers along
the Oregon Coast



Lair H. Gregory
of The Oregonian,
Portland, Ore.



This apparatus works on the principle of insufflation, a process that consists in expanding the lungs with air at regular intervals of about 12 to the minute and depending on the elasticity of the chest walls to expel a portion of the air during each intervening period. In using the apparatus, a board is first strapped tightly over the abdomen to prevent the stomach instead of the lungs from being expanded with the air. The mouth tube attached to the apparatus is then placed in the mouth and pushed as far back as it will go, and the tongue is pulled forward and tied to the tube. The tube pushes the soft palate upward and effectually closes the passageway through the nose so that no air can escape through the nostrils, while an opening in the bottom of the tube permits the air to pass freely down the throat.

For supplying the air, an ordinary glass blowers' bellows is used. As

the air goes up the tube it passes a valve which regulates the inspiration and expiration. With watch in hand, the attendant turns the ring that governs this valve alternately to the right and left at regular intervals. When the ring is turned to the right the air is forced into the lungs, and when the ring is turned to the left the pressure is shut off, a small vent is opened and the air escapes from the lungs. Just below this valve is one for regulating the pressure of the air given the patient. At the start the pressure used is very low, but is increased by a gradual closing of the valve. At the end of a minute the patient's breast is usually heaving regularly and the full pressure is applied.

In case the apparatus is hurriedly called into use during an abdominal operation, in which case the abdominal board cannot be strapped on, a small tube is passed through the mouth tube and inserted into the

stomach and the air escapes through this as fast as it is forced into the stomach. An important feature of the apparatus is that it can be operated by one man, who need not be an ex-

pert. The bellows is worked by the feet and the respiratory valve is operated by the right hand, leaving the left hand free for making any adjustments that may be necessary.

FIRELESS COOKER USED FOR DELIVERING HOT FOODS

Fireless cookers used in connection with a coöperative kitchen in a city in New Jersey are said to contribute more than does any other one feature to the success of the enterprise, since with these it is possible to deliver the food steaming hot to the users of the service.

Each of these cookers is equipped with a number of compartments nested together. Each is provided with a bail, and with this the cooker is carried direct to the dining room of the customer without removing the foods from the compartments in which they have been cooked.

WINDSTORM LEAVES RECORD IN GROWING TREES

The little diagonal streaks or wrinkles across the grain that indicate weakness in timber are not only caused by rough handling but by wind stresses during the growing period and can sometimes be used to check official records of windstorms, according to a report issued by the United States Department of Agriculture. The marks are caused by "compression failures," which occur when the fibers bend or buckle under a too heavy strain. In cutting up logs at the laboratory it was found that such wrinkles

Information sheet sent out
by Forest Service



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appeared on the north side of a number of trees coming from the same locality in Florida. By counting the annual rings of the wood it was decided that the wrinkles must have been caused by a severe windstorm from the south about the year 1898. Inquiries made in Florida revealed the fact that a hurricane had swept over the region at the time indicated.

CLEVER NOVELTY DESIGNED FOR ADVERTISING USE

An ingenious advertising novelty intended for window-display purposes has been invented in France, which, because of the seemingly mysterious manner in which the law of gravity and other physical rules are apparently violated, easily attracts and holds the attention of passers-by. It consists of a hollow metallic cylinder supported on a pedestal and connected by electric wires which are easily hidden from view. Inside the cylinder is a revolving electromagnet.

When the device is in operation, such articles as a doll, a cigarette box, and a ball move slowly about its circumference, to all appearances suspended in air without any means of connection. On the interior of each, however, is a soft-iron core

which is attracted to the circular wall by the drawing power of the magnet. Since the latter member constantly rotates, the objects clinging to the outside move with it.

-Francis P. Mann

12 Boulevard Arago,

Copyright, France

material

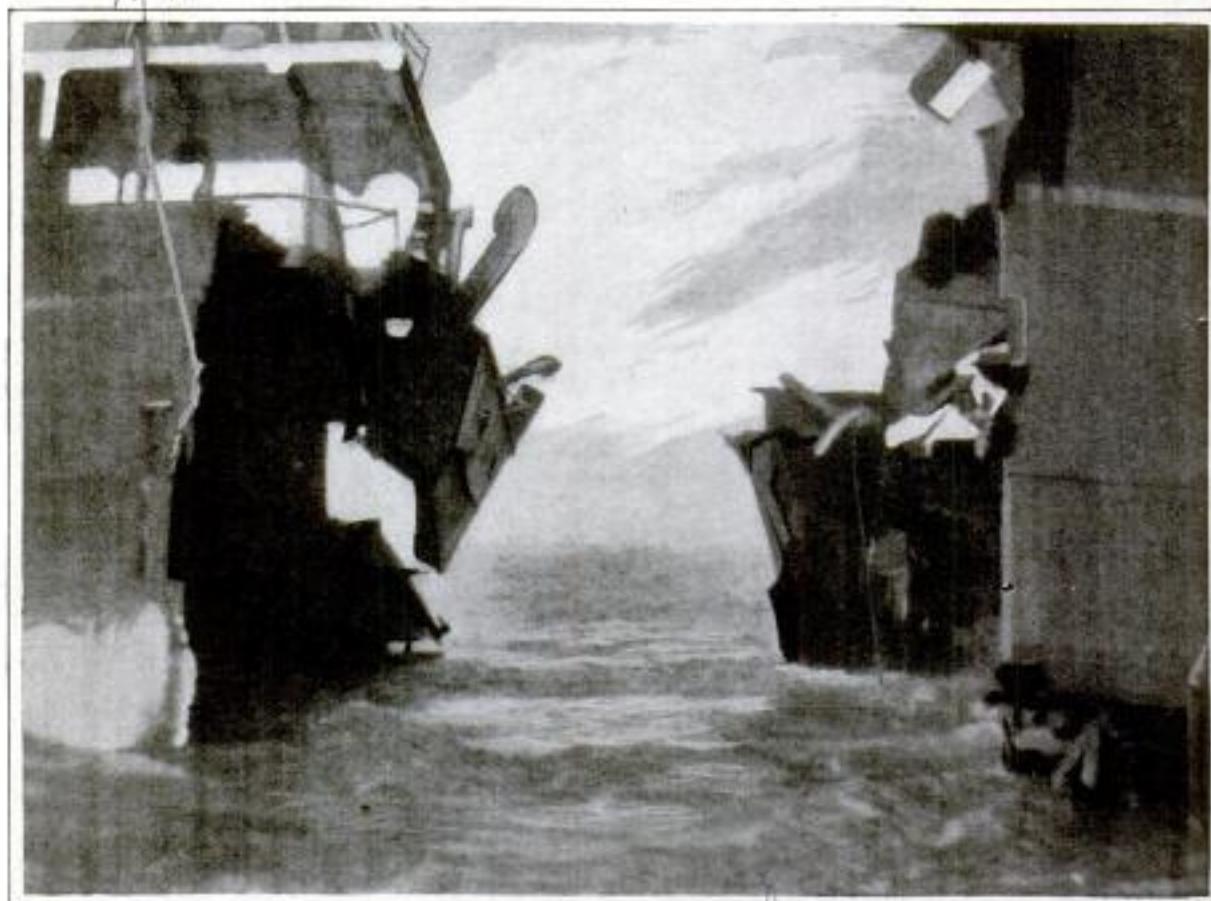
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238 Williams St., N. York City

WHEN THE WATERS ROSE ON SALISBURY PLAIN



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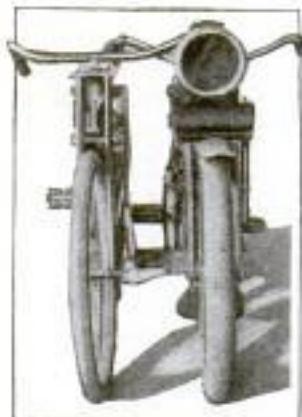
Wreck
COPRIGHT, UNDERWOOD & UNDERWOOD

DANISH MOTOR SHIP BROKEN IN TWO ON ROCKS

WHILE en route from the Pacific coast to Copenhagen, the Danish motor ship "Malakka" was driven during a severe gale onto Red Rock at Cedros Island, off Sebastian Vizcaino Bay, on the coast of Lower California. The breakers pounded the vessel with such force that it broke completely in two amidships, separating far enough for a small-sized boat to pass through the gap and exposing the cargo, consisting of wines, flour, and general freight, to the sea. The vessel was 410 feet in length and had a 52-foot beam and a gross register of 5,150 tons. It was making its maiden voyage in the service of new owners when the wreck occurred.

LIGHT-WEIGHT MOTORCYCLE
OPERATES INEXPENSIVELY

9239 To bridge the gap between the ordinary bicycle and the modern, high power motorcycle, a light-weight medium-power machine has been developed. It is built with a sturdy frame of the loop type, much lighter than that of the average motorcycle. With its tanks filled the machine weighs only 110 lb. as compared with the approximate average weight of 260



lb., or more, of the larger cycle. In its design and means of control, there is little difference between it and its predecessor. Because of its lightness, it uses smaller and less expensive tires and may be operated very cheaply.

CEMENT COATING FOR STEEL
IMMERSED IN SEA WATER

9423 From tests made to determine the degree of protection against the action of sea water given to steel by coating it with cement, it has been found that the life of steel structures immersed in sea water can be considerably prolonged by such coatings from $\frac{1}{2}$ in. to $1\frac{1}{2}$ in. thick, but that the protection is not great enough to dispel all apprehensions as to their permanency under such conditions.

Canal Record

The Miami Cycle & Mfg. Co.,
600 Middletown, Ohio.
Mobile St.

DIRECTING THE WAR BY WIRELESS

By GEO. F. WORTS

U. S. Licensed Wireless Operator, First Class

THE European war cloud burst at the psychological moment in the career of wireless telegraphy, for only very recently has the art based on the science of ether waves been reduced to the reliable basis of a sound industry. Five years ago, or even less, wireless could not have responded to the exacting demands which this war is putting upon it.

At the beginning of hostilities cables and telegraph lines were ruthlessly cut. Germany, more than any other belligerent, has been in an exceedingly trying position as regards external telegraphic communication, surrounded as she is by enemies on all sides. Her main cables have been cut or disconnected, so that now her only electrical communication with the outer world is by wireless. At the outbreak of the European war, Germany had 17 government wireless stations, Austria-Hungary, 4; France, 18; Russia, 28; and England, 47.

One of the first tasks of the wireless of the various warring countries was to fill in the gaps caused by severed cables. As later incidents have proved, however, that was only an insignificant portion of the work. Hundreds of miles of roaring battle line, hostile warships roving the remotest wastes of the sea, aeroplanes and Zeppelins soaring high above the earth, even the stealthy submarines, lurking in the depths for victims, are subservient to the invisible hand of the wireless.

The wireless equipment with which General Joffré keeps in touch with the fighting line of the allies has a range of 200 miles, and is portable. Within 15 minutes after the command is given, the station can be erected and put in operation. At the front, smaller and lighter equipments, known as "knapsack" stations, are employed. These are so constructed that one complete set can be divided up and carried by four men, with an average weight to each man of 20 lb. Five minutes after

the command for erection is given, these sets are in operation.

Besides the knapsack stations, a new and ingenious auxiliary equipment has been devised for cavalry scouting duty, called "whisker wireless." This odd name arises from the bristling appearance of the antennae which project like the quills of a porcupine from the horses' flanks.

"Landing stations," having a range of 50 miles and designed for impromptu service, are used by the marines. For example, when a cruiser anchors off shore and sends a detachment of men for scouting duty, they carry with them this very compact equipment which can be set up hurriedly.

Probably the most novel use to which wireless has been put in this war is in aeroplane service. The equipment installed on the French and Belgian fliers weighs about 100 lb., and is exceedingly compact and simple. The metal frame of the aeroplane forms the antennae, while a long trailing wire is used for "ground." This wire is attached so that should it become entangled in a tree or other obstruction, it automatically pulls loose, and another one is substituted.

Wireless communication over a distance of 54 miles has been carried on from an aeroplane to a land station in the U. S. Army, but greater ranges than five to ten miles are not practical or necessary. In service, the wireless-equipped aeroplane is sent on scouting duty over the enemy's lines from a base at which a knapsack station is located. It is rarely necessary for the aeroplane to fly to a greater distance than two or three miles from this base. As he flies over the enemy, the operator telegraphs the condition or maneuvers of the enemy to the knapsack station. Surprises on both sides are constantly being frustrated in this manner. As a matter of incidental interest, it is due principally to this fact that there have been no recorded surprise attacks made by

either side on the Franco-German frontier and that a deadlock exists now.

The wireless telegraph comprises an important part of the equipment of Zeppelins. Much greater transmitting power, due to a larger space allotment, is made possible on the Zeppelins and French dirigibles. A greater range also results from the use of a larger antennae system.

A wireless direction finder, to supplement the aeroplane spying service, has recently been adopted by the British for the purpose of locating wireless stations at German artillery bases. When the approximate location of a battery is thus found, the British and French guns are trained upon it. An English radio engineer, who recently visited this country, made the statement that by means of one of the field direction finders the exact location of the admiral's ship of the "hidden" German fleet had been discovered by an officer.

The secrecy of the interior of submarines is proverbial, but it has been stated on authority that a wireless equipment of short range is in use on the majority of underwater craft. When a submarine is cruising on the surface, a short mast, or the periscope tube, is used for suspending a small antennae system. The equipment closely resembles the aeroplane installations. For an aerial conductor, when the craft is traveling submerged, an insulated jet of water is substituted for the regular antennae.

Practically every move that the British, French, or German fleets make is the result of a radio order from the respective war office. The impotence of Germany's bottled fleet at present rather limits this use of her wireless service, although the British fleet relies upon orders via radio exclusively. England directs the maneuvers of her fleets from the Marconi station at Carnarvon, Wales; Germany, from Nauen, and France, from Paris. Except for one hour each day, Carnarvon transmits the orders of the British Admiralty to the various ships in a very complex secret code, which is changed

daily. To further insure secrecy, the wave length is frequently and suddenly changed. The principal advantage gained in directing fleets wirelessly is that fewer ships can now do the work of the many which were formerly required. Before the days of radiotelegraphy, ships of a fleet clung together, and orders were either semaphored or carried from ship to ship by fast cruisers. A naval battle line, 200 or 300 miles long, is now quite feasible, while in the days before wireless telegraphy one only a fraction of that length was possible.

Except when a warship is actually under fire the wireless room is perhaps the liveliest place on board. Every message caught on the instrument, whether intended for that particular ship or not, is delivered to the captain. Whenever anything suspicious is sighted—smoke on the horizon or a speck in the sky that might be a Zeppelin—it is immediately reported to the rest of the fleet. Aside from messages of a general character, such as this, the operator must be constantly on the alert for battle orders from the admiral. The rôle played by the wireless operator in war time is certainly not a desirable one, at least from the standpoint of personal safety. He is always shut up tightly in his room, fully aware of the dangers of attack by air, sea, and submarine.

The Eiffel Tower station at Paris has a most systematized method of collecting information from all parts of the war zone. By the use of an ingenious recording apparatus, any number of messages, up to ten, can be received simultaneously. An incidental purpose of the Eiffel Tower plant is to transmit news to the soldiers in the trenches. The tremendously high-powered transmitting apparatus, combined with the 900-ft. high tower, makes a 3,000-mile range possible, so that France is kept in constant touch with her fleet.

Perhaps the most romantic use to which wireless has been put in the war was in the case of the "Emden," the German cruiser which, early in the

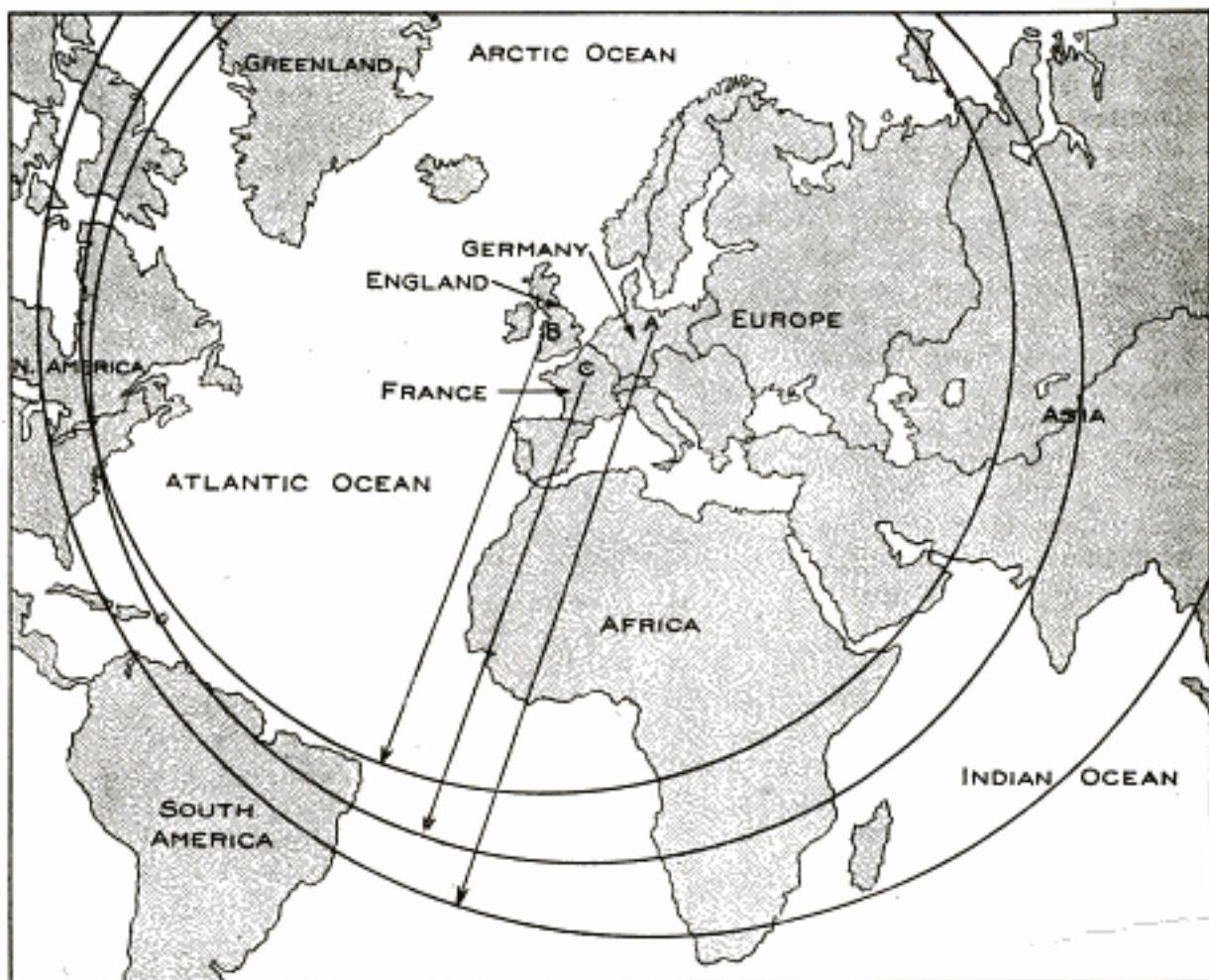


Diagram Showing Range of Wireless from Nauen (A), Carnarvon (B), and Paris (C)

war, sank many British merchant ships in the Indian Ocean. It is stated by those who claim to know that the "Emden" received all its instructions direct from the enormously high-powered station of Nauen, Germany. The signals sent out from Nauen are so powerful that they can very often be heard on amateurs' instruments in the United States—a distance of nearly 4,000 miles. With this exceptional working range, the "Emden," or any other ship for that matter, might receive orders if she were cruising near Greenland, Rio Janeiro, Cape Town, or Singapore. It is quite probable, therefore, that the "Emden" accomplished her work from orders or information she received from Nauen while she was cruising in the Indian Ocean. Strangely, wireless also proved the "Emden's" undoing. Just before she attacked Direction Island and demolished the wireless and

cable stations there, one of the Direction Island wireless operators flashed out an S O S call. This was picked up by the "Sidney," and the engagement shortly followed in which the "Emden" was sunk.

The "Karlsruhe," another German ship, acting with her convoys, adopted an ingenious dragnet method of capturing British vessels. The German cruisers reduced the sending radius of their apparatus to 30 miles, and traveled forward in a circular formation no more than 30 miles in diameter. When an enemy was sighted by one of the circle, the others were notified and the ring closed in on the helpless victim. By thus reducing the transmitting range the possibility of attack by British warships was very slight.

The inevitable command of the Germans upon capturing a ship is "Don't use your wireless!" Usually that or-

der is followed by imperative instructions to cut down the antennae and throw it overboard together with the instruments. For what is so helpless in these days as a ship without wireless?

The British war code is so complicated that it should be insoluble. Once, however, the Germans used it to advantage in a "fake" message. When the war started, the "Breslau" and the "Goeben" were bottled in the Strait of Messina, between Sicily and Italy, by a British squadron. During the morning of August 6, the British commander received a wireless message, apparently from the British Admiralty, ordering the release of the "Breslau" and the "Goeben." Not until long after the two German ships were safely at sea was the falsity of the message discovered.

One of the most interesting phases of the wireless-in-war-time question concerns secretly operated stations. The press, on numerous occasions, has appeared with the announcement of the existence of a hidden wireless station in this country operated by one of the belligerents. This possibility is so remote as to be ridiculous. An amusing example of this occurred recently when various newspapers announced that the "Germans and Japanese were suspected of operating hidden plants in

Lower California and the Maine woods." Whoever was the well-meaning source of this information, the fact remains that the supposed "German station in Lower California" was none other than the new Marconi trans-Pacific station at Bolinas, Cal., while the "hidden radio plant" in the Maine woods turned out to be a perfectly harmless commercial station at Wellfleet, Mass. The U. S. Government would have a tremendous task on its hands if an attempt should be made to dismantle all privately owned stations, as more than 100,000 of them exist. Germany, France, and England, however, whose wireless laws have always been much stricter than ours, have ordered every private aerial down and all instruments disconnected.

Numerous "wireless spies" have been discovered in all of the warring countries, and when convicted they have met the customary fate.

Interference with wireless messages as they are now handled by the perfected army and navy equipments is practically impossible. Telegraph wires and cables may be cut, but a wireless wave cannot be stopped. "Jamming," or sending out waves of the same length as a transmitting station to confuse the receiving operator, is averted by making frequent changes of wave length at known intervals.

ARCH SUPPORT IS ATTACHED 9076 TO OUTSIDE OF SHOE

Made of rubber so as to be flexible and yielding, an arch supporter has been introduced which is intended to be attached on the outside to the shank of a shoe, instead of being worn on the inside next the foot, as has heretofore always been done. A means of fastening the supporter in place has been devised so that while it is held



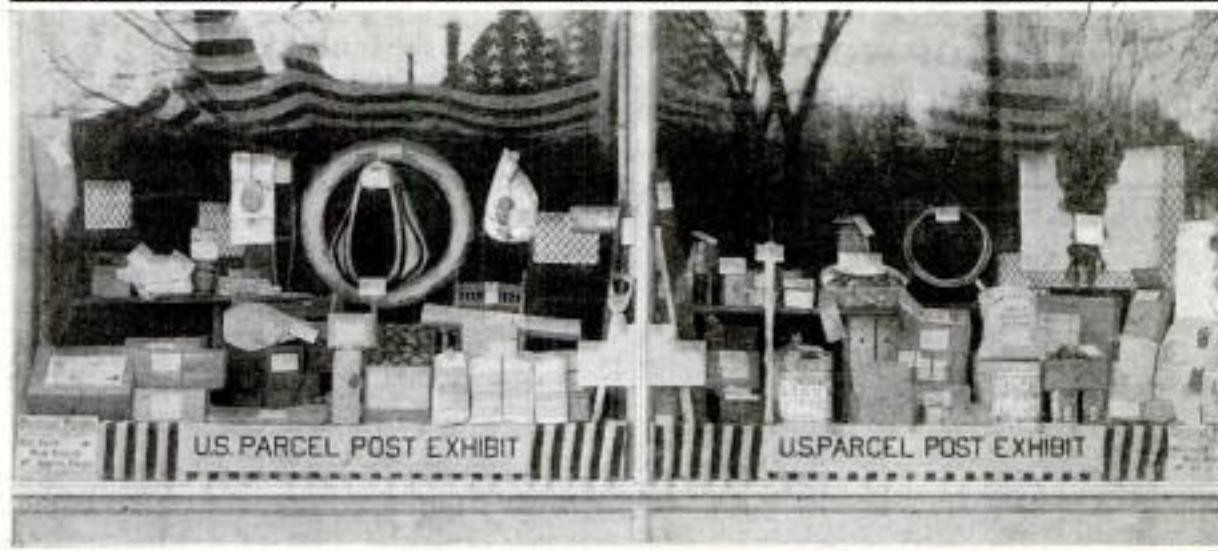
India Rubber World 12/1/14
The Dr. Neal Co., Portsmouth,
N.H.

securely it may also be detached and applied to another shoe in a moment's time. A pair of clips are tacked to the shoe under the arch of the foot, while two flanges extend from metal pieces anchored in the rubber block. By means of these connecting members the device may be applied quickly.

ADVERTISING PARCEL POST 8992 BY WINDOW DISPLAY

A novel and effective method of advertising the U. S. Parcel Post was devised by the postmaster of Cañon City, Colo. The post office has a large show window, and in this were placed a great variety of articles that could

Florence L. Clark, 412 Greenwood Av., Canon City, Colo.



How a Colorado Postmaster Advertised the Advantages of Parcel Post

be or had been shipped by parcel post. The list included boxes of apples, sacks of flour, hams, rocking chairs, shovels, and many other commodities the sending of which by parcel post would not ordinarily occur to most people. Each was properly wrapped, tagged, and addressed, and placards showed the weight and the cost of postage to different points. One result has been a large increase in the parcel-post business at Cañon City.

WAR CAUSES EXTENSION OF ELECTRIC LIGHTING

Since both petroleum and copper are essential military supplies, the German people have had to face the problem of finding a substitute for kerosene for lighting purposes that would not involve the construction of additional copper electric-light circuits. The answer was found in a soft-iron wire, insulated with impregnated paper and inclosed in a water-tight metal covering. With this wire, electric lighting is being installed in thousands of houses that had formerly been lighted by oil. Many new gas installations are also being made since the government took over all supplies of copper and petroleum, while alcohol and acetylene lights are being adopted in the country districts.

Christian Science Monitor

SPEAKING TUBES ARE USED BY MOTOR-CAR RACERS

At a motor race run at Los Angeles recently, the driver of one car and his mechanician wore helmets and masks which were linked with speaking tubes that enabled them to talk freely to each other. When a machine is tearing along a track at high speed, the reports of the explosions in its engine cylinders also producing a loud roar, it is next to impossible for either occupant to make himself heard if he wishes to communicate with the other. In this instance speaking tubes, extending from the mouth of each person to the ears of the other, were used.



Speaking Tubes Joined the Helmets of These Auto Racers, at a Recent Speed Contest, Enabling Them to Talk Freely to Each Other While Driving

Devised by Eddie Rickenbacker

626 Alvarado Street, Los Angeles, Calif.

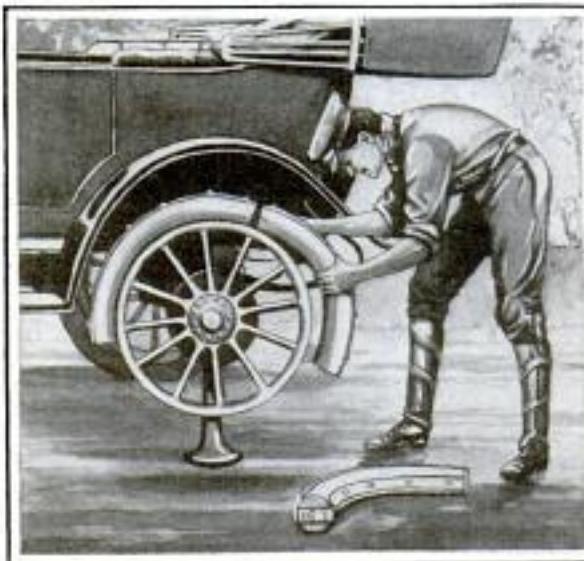
Inventor: B. R. Bonney 1105 No. 29th St.,
Omaha, Nebr.
Mfr.: at 1225 No. 22d St., Omaha, Nebr.

653

POPULAR MECHANICS

EMERGENCY MOTOR-CAR TIRE MADE OF WOOD

Intended only for emergency use on the road, a wooden motor-car tire has



Made of Wood and Divided into Three Sections, This Motor-Car Tire is Held to the Rim by a Single Bolt

been invented to do away with the necessity of carrying extra casings which are expensive and in danger of being stolen when a machine is left unattended. The tire is made in three sections and so designed that it is held fast to the rim by a single bolt, while the operation of fitting it in place is one

which requires only a very few minutes. On the inner side of each section are rubber pads which are intended to absorb the shocks. Except for a thin steel band, encircling the circumference of the tire to lessen the wear on it, no metal is visible. It may be carried set up in a holder, or may be unjointed and placed beneath a seat.

GAS EXPLOSION IS CAUSED BY ROBBERY OF METER

An explosion of illuminating gas which completely wrecked a residence at Moline, Ill., recently, was the aftermath of a burglar's breaking into the house and robbing a gas meter of the "quarter-first" type. In order to get the money out of the meter the thief tore it loose from its connections and then broke into it. Later, when the occupants of the house returned after an absence of a few hours, a match was ignited. Instantly there was an explosion which blew out the ceiling of one of the rooms, lifted the roof off one side of the house and broke all the windows. Although half of the house was nearly demolished, the person who ignited the match was uninjured.



The Roof of This House was Blown Off by an Explosion of Illuminating Gas Which did Not Injure Those in the Room in Which It Occurred

Eugene Witlick
104 - 6th Ave., Moline, Ills.

Dr. Nikola Tesla
+ Madison Ave. Woolworth Bldg.
N.Y. City.

POPULAR MECHANICS

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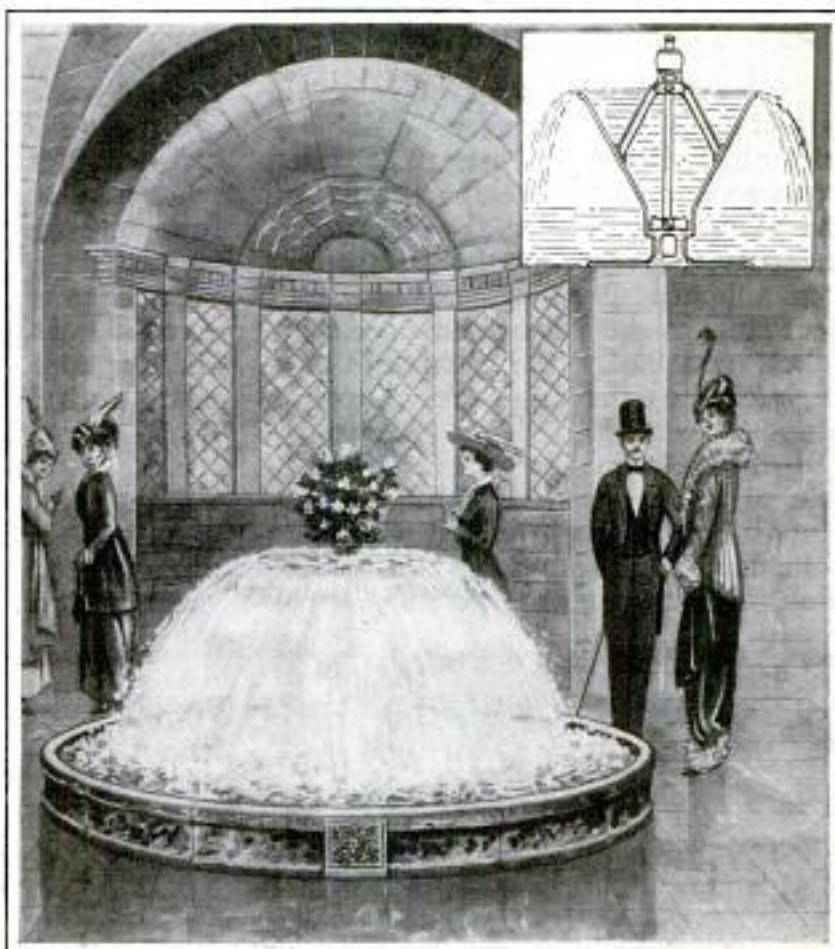
FOUNTAIN USES SAME WATER 9133 OVER AND OVER

The use of fountains in landscape gardening and architectural ornamentation is much less common than formerly, owing to the expense of keeping up a steady flow of water which runs to waste without serving any useful purpose save the decorative one. In some municipalities where the public water supply is pumped at great expense, the use of fountains on private grounds is forbidden by ordinance. Other cities forbid their operation except within stated hours, while in almost every city where fountains are permitted to operate freely the cost of the necessary amount of water to produce the volume of flow requisite for the most attractive effects is almost prohibitive.

An entirely new kind of fountain recently patented by Dr. Nikola Tesla, the famous electrical inventor, is designed to do away with the existing drawbacks to the use of water fountains for ornamental purposes. The device consists of a basin large enough to hold the entire volume of water required; a central pipe rising to any desired height from a point well below the water level, and flaring, or lipped, at the upper end to shape the flow of the falling water; a screw propeller, or turbine, so placed inside the pipe and below the level of the water in the basin as to propel the water up the pipe when rotated, and an electric motor mounted at the upper end of the vertical shaft of the turbine. The wires supplying current for the motor may

be brought down from above or, if it is desired to conceal them, they can be easily led through water-tight tubes along the central pipe.

With a properly designed propeller a very large volume of water can be passed through this fountain in a continuous stream, producing beautiful effects as well as serving to humidify and cool the air when used indoors. Experiments on a large scale have



A New Kind of Fountain That Uses the Same Water Over and Over Again. A Diagram of Its Construction is Shown Above

shown that it is not necessary to replenish the water for weeks, when the fountain is operated continuously, for the entire volume is passed through the fountain several times a minute and becomes aerated and purified in the process.

A fountain of this type, requiring no external water connection, may be moved from one place to another easily, and when constructed of small size, serve as a banquet-table decoration.

Overflow basins may be arranged in tiers so as to provide for a series of falls by extending the central pipe upward and providing outlets for the water at different levels. Colored electric lights can be placed behind the falling water to produce gorgeous effects. The cost of electric current to operate this fountain is said to be very small indeed.

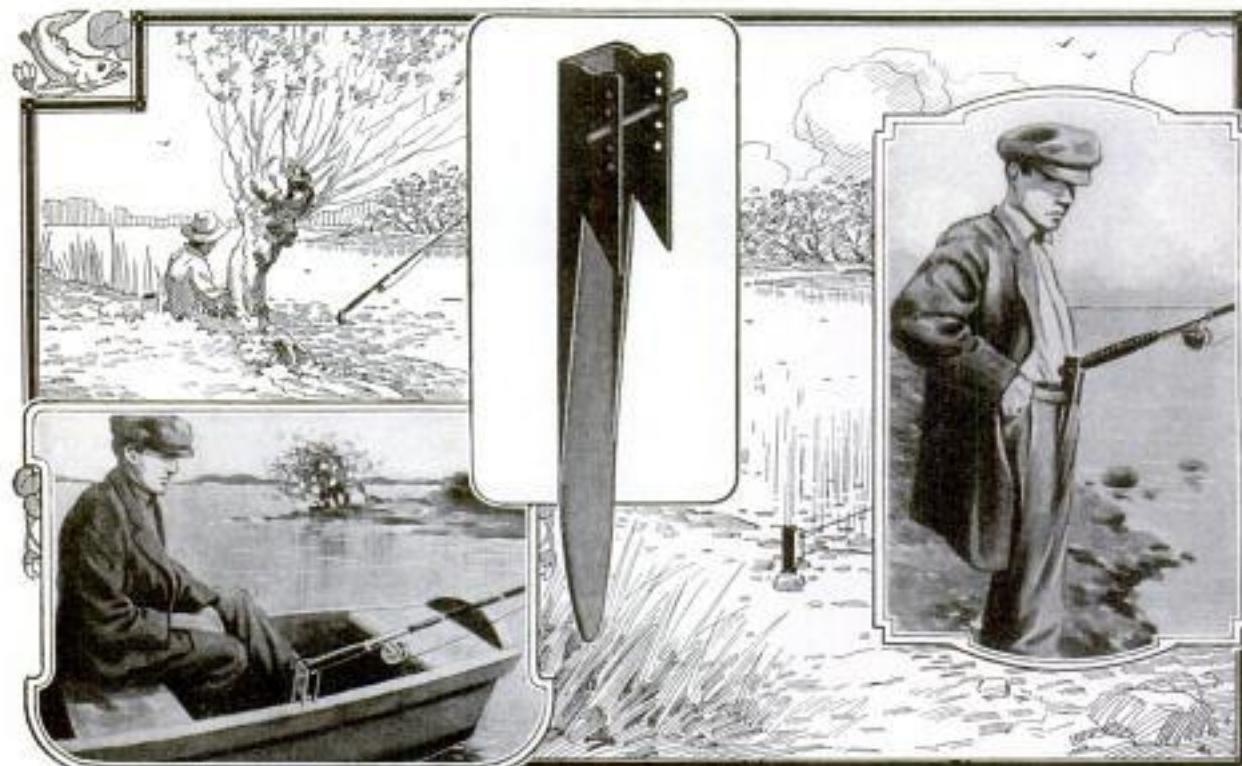
ADJUSTABLE POLE HOLDER FOR FISHERMAN

Designed so that it may be used in a number of different ways, a fishing-rod holder has been invented which performs a real service for the fisherman who is using several poles simultaneously, especially if he be trolling from a boat. The device is made of sheet steel in the form of an adjustable socket, which, by the changing of a pin, regulates the angle at which the pole may be held. It is possible to use it in almost any place, from the gunwale of a boat to one's trouser belt. A small bell is also provided which fits to the device and sounds an alarm when a fish takes the bait.

HOW MUCH IT COSTS TO BUILD WIRE FENCE

An idea of the cost of building barbed-wire fence is given in a circular relating to fence building in North Dakota, recently issued by the United States Department of Agriculture. The costs in North Dakota are high owing to the fact that all material, including posts, must be shipped in, and for this reason the figures are thought to represent practically a maximum for this country. The maximum cost per rod is 36.9 cents, for a three-wire fence with posts spaced one rod apart. A two-wire fence with posts spaced one rod apart costs 32.2 cents per rod; a four-wire fence with posts spaced two rods apart costs 29.7 cents, and a five-wire fence with posts spaced three rods apart, 30 cents. The figures also show the low cost of wire as compared with posts both in construction and in upkeep.

One hundred and thirty-three foreign-built ships with aggregate tonnage of 475,524 had changed to American registry up to March 1, 1915.



A Convenient Holder for a Fishing Pole Which Is Especially Serviceable When Several Lines are Trolled from a Boat

Inventor & Contributor:

a. C. Hall, 1605 Second Ave., H.P.,
Richmond, Va.

Sprague Canning Machines, Co., Chicago
National Canners' Association
J. C. Lee Earthy, Evening Star, Wash. D. C.
RAISING THE STANDARD OF CANNED GOODS

How the Pure-Food Laws and the Cooperative Efforts of the Canners
have Revolutionized the Industry

9393

WITH a can opener and a corkscrew as her only kitchen implements, the housewife of the future—or even of today—can feed her family better food and in wider variety than her mother, with a whole armory of pots and pans, could ever dream of doing. The day when wholesome, nourishing, palatable food could be prepared only at home has passed, never to return. Canned goods are no longer regarded in the light of "emergency rations," but have become firmly established as an important part of the domestic economy of almost every American household. Nor is it difficult to understand the reasons for the enormous increase in the consumption of cannery products in the past two or three years.

A universally higher standard of quality, due to the greatly improved methods of canning stimulated by national and state pure-food laws; the extension of this method of preparation to a long list of foodstuffs that a few years ago had to be cooked at home, if at all; and economy, if not actually in dollars and cents, at least of the housewife's time, labor, and nerves—these are the underlying causes of the change.

Foodstuffs can now be obtained in cans, or other containers, in such wide variety that not only a complete dinner, but dozens of kinds of dinners can be served with no labor other than that of opening the containers and heating such foods as are to be served hot. A recent list of canned foods, which had received the approval of one of the pure-food laboratories, named 132 different kinds of edibles. It would be hard to mention any sort of food outside of fresh meats that cannot be obtained in cans or packages of some kind.

The steady improvement in the quality of commercial canned goods, which has almost entirely removed the prejudice that formerly existed, is due in large part to the action of the can-

ners themselves, who, through their national organization, are attempting to see to it that all canned foodstuffs placed on the market shall be canned under sanitary conditions, free from impurities, and honestly labeled. This National Canners' Association is an organization working in close touch with the Department of Agriculture and is made up of the manufacturers of about 75 per cent of all the canned goods produced in the United States. While this organization is neither altruistic nor charitable, it is not commercial, since it has no part in the profits arising from the trade and will not permit its name to be used in connection with the advertising of any canner. In its laboratory, at Washington, D. C., is complete apparatus for testing canned goods of every kind; for experimenting with raw foods to determine the best methods of canning; for making tests to solve the problems of individual members of the association who are having trouble with their processes, and for testing materials for determining the best kinds of containers for different foods. Installed in the basement of the laboratory is a small but complete canning plant for experimental purposes. In addition to its other activities the association takes an active part in the promotion of pure-food laws, and always holds itself in readiness to investigate and remedy, if possible, any abuses in the canning industry that may be reported to it.

A typical example of the kind of service the association gives is the case of a canner who forwarded to the laboratory samples of canned fish which, when opened, were found to be covered with minute black specks. The association chemists found that the specks were due to the salt used in seasoning the fish, and that they were harmless, although they spoiled the looks of the product. The salt had not been dissolved properly and had been made black by coming in

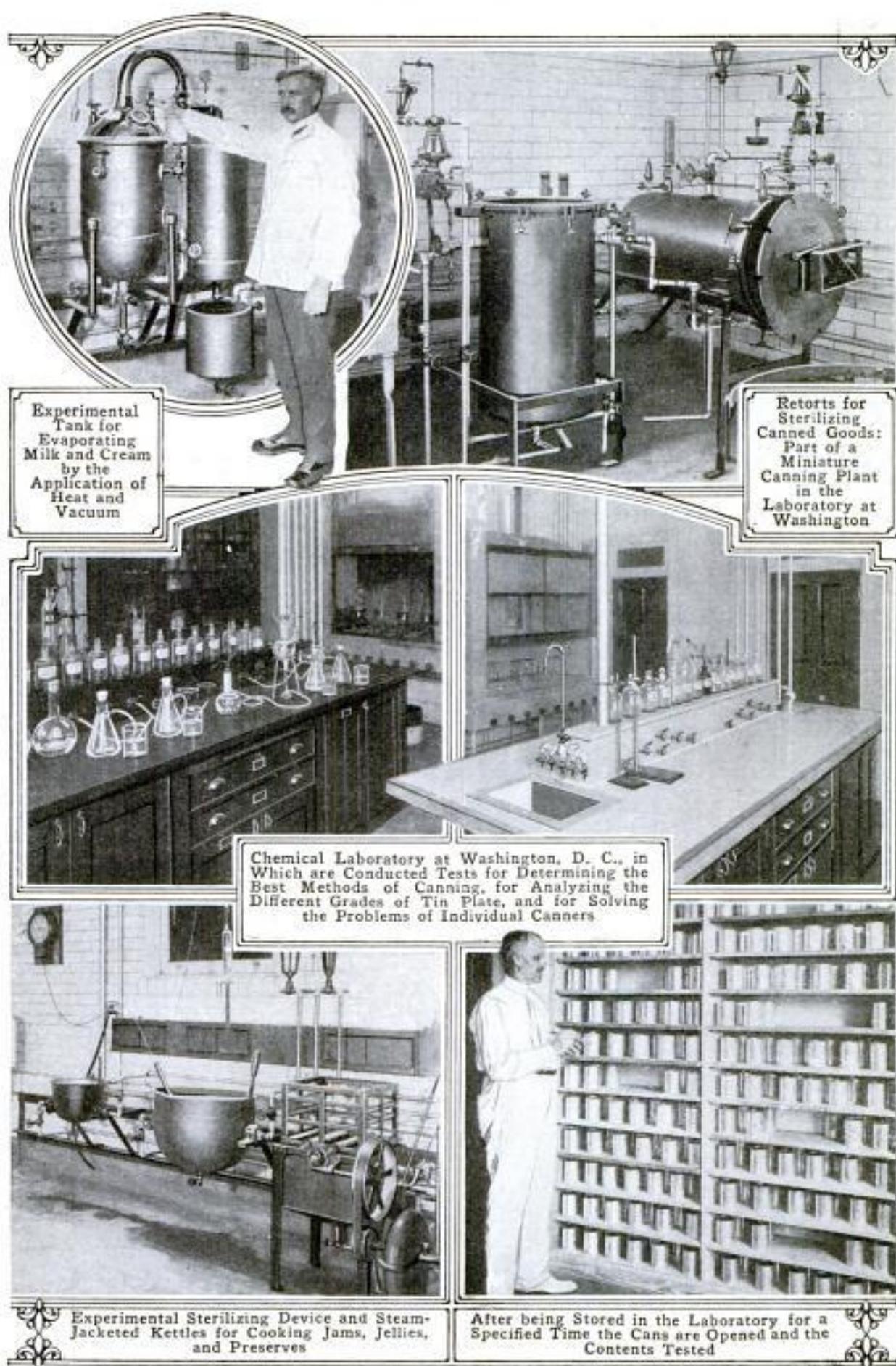
contact with the tin. The chemists instructed the canner as to the best methods of adding the salt, and no further trouble was experienced. A fatal case of poisoning resulting from the eating of canned tomatoes was reported to the association. The chemists found that death had been caused by rat poison placed in the tomatoes and the investigation resulted in the conviction of the murderer. Canners occasionally experience difficulty because of the water which they use, some of the so-called "hard" waters having a marked effect on canned goods, even to the extent of changing their chemical composition. When trouble of this kind is encountered an analysis of the water is made at the laboratory and the canner is told how to avoid the difficulty. Whenever an investigation is of benefit only to the individual canner the cost of the laboratory work is charged to him, but if the findings are of interest to canners generally, it is done free of charge, the work of the association being supported by dues paid in by the members.

Sterilization, which has entirely replaced chemical preservatives, is the most important as well as the most difficult feature of modern canning. Not only do different meats, vegetables and fruits require different treatment, but the same vegetables and fruits raised in different parts of the country require the application of different degrees of heat. Unusual problems in sterilization come up continually in the laboratory work. A Virginia canner used for a part of his product tomatoes grown on a soil heavily fertilized with a commercial fertilizer. These tomatoes alone out of all those canned at the factory could not be sterilized so they would keep after being canned unless they were subjected to a temperature of 235° F. When analyzed, this unusual case of spoilage was found to be caused by a hardy spore-bearing bacterium that had evidently been introduced into the district by the commercial fertilizer.

Spoilage of foods, whether canned or not, is caused by bacteria, yeasts, and molds, and the sole purpose of sterilization is to kill these elementary forms of life. While there are many kinds of bacteria, they may all be divided into two classes so far as the canning industry is concerned—one class comprising all bacteria that can be killed at or below the temperature of boiling water, and the other class comprising all bacteria that require a higher temperature than this. The latter is one of the things that make home canning frequently a failure, since sterilization at temperatures higher than 212° F. cannot be accomplished with ordinary cooking utensils, but requires the use of a closed retort and special apparatus for applying the steam. Experiments made at the laboratory indicate that the hardiest known bacteria, with the spores by which they are propagated, are killed at 250° F., if this degree of heat is applied to them directly for a period of 20 minutes.

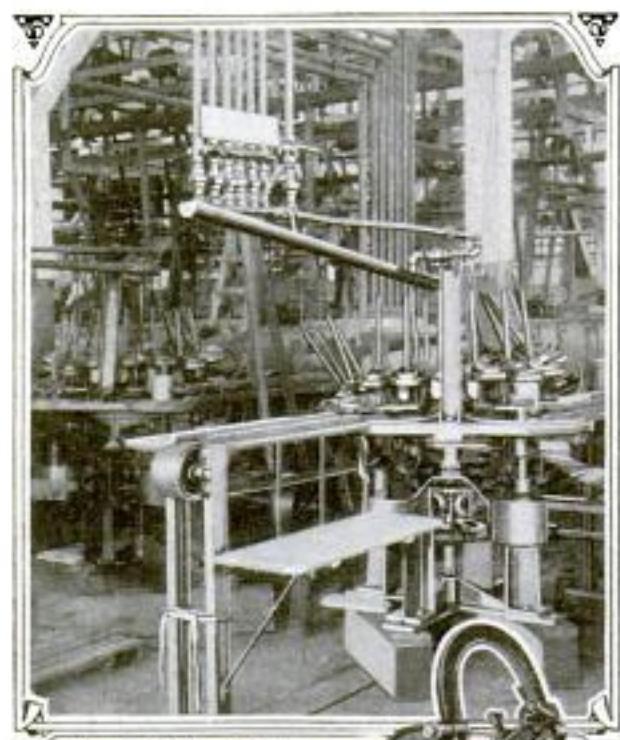
A modern cannery is a well-organized and sanitary establishment far different from the rough shed, housing crude machinery and processes, that was formerly thought to be sufficient. The location and surroundings of the typical cannery must be sanitary, away from manufacturing establishments that produce noxious odors or organisms of decomposition. The yards and drives about the establishment are cleaned daily and the drainage of the premises is good. The interior of the cannery is kept clean, and in contrast with the old type of cannery, there is provision for plenty of light and ventilation. In short, the modern canning establishment is not only designed to turn out canned food-stuffs under sanitary conditions, but to provide healthful working conditions for its employees. In most of the process handwork has been superseded by machinery.

The first requirement in all good canning is that the raw material be delivered to the factory in good condition, fresh from the field or orchard, and so packed or crated that it can be

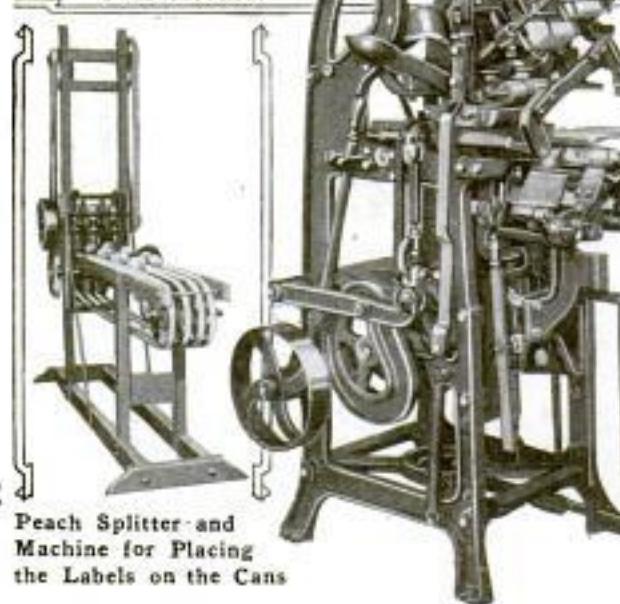


Experimental Sterilizing Device and Steam-Jacketed Kettles for Cooking Jams, Jellies, and Preserves

After being Stored in the Laboratory for a Specified Time the Cans are Opened and the Contents Tested



The Machine That Seals the Cans



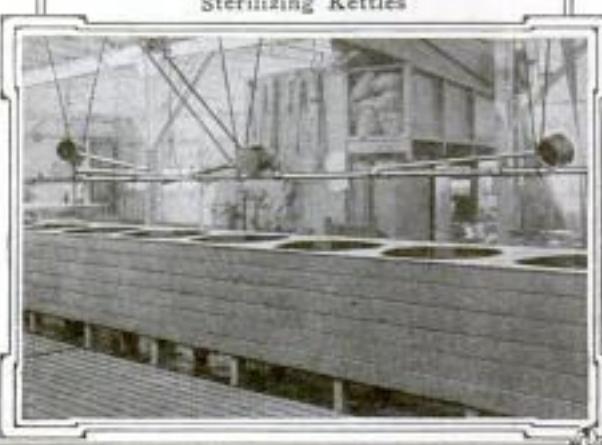
Peach Splitter and
Machine for Placing
the Labels on the Cans

handled without injury. The first step is that of grading, which is usually done on belts or special table tops to expedite the work. All fruits and vegetables must be thoroughly cleaned, and this is ordinarily done by washing in a tank and then thoroughly cleansing with a spray. Many of the fruits require no special preparation other than sorting and cleaning, after which they are placed directly in

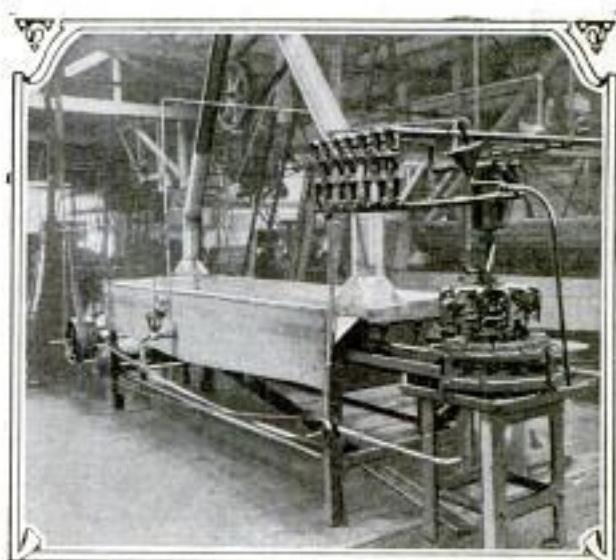
the cans. Such fruits as peaches, apples, and pears must be peeled and cut into pieces of the right size. This operation, formerly done by hand, is now performed by machinery in all well-equipped establishments. Nearly all vegetables require special treatment of some kind. Peas are shelled, graded for size and quality, and washed and blanched by automatic machinery. Corn must be cut, silked, brined, and cooked. Beans must be snipped and strung, graded for size, and blanched. Asparagus must be cut into lengths and blanched, while sweet potatoes and beets must be peeled and graded. Blanching consists simply in parboiling and is not done primarily for the purpose of whitening, as might be supposed from the name, but to improve the quality. The vegetables are dropped into boiling water for from one to five minutes, with the result that they are softened and much of the mucous sub-



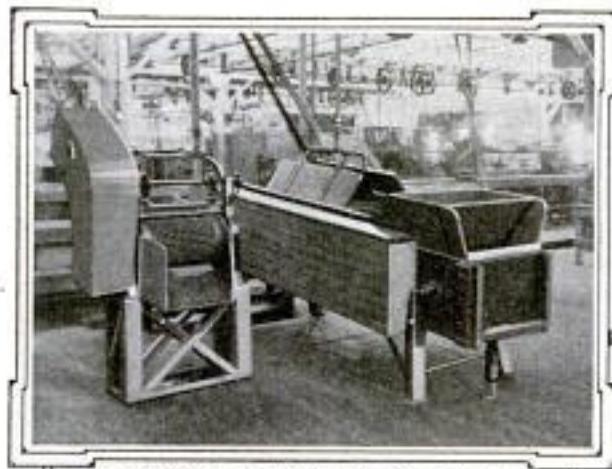
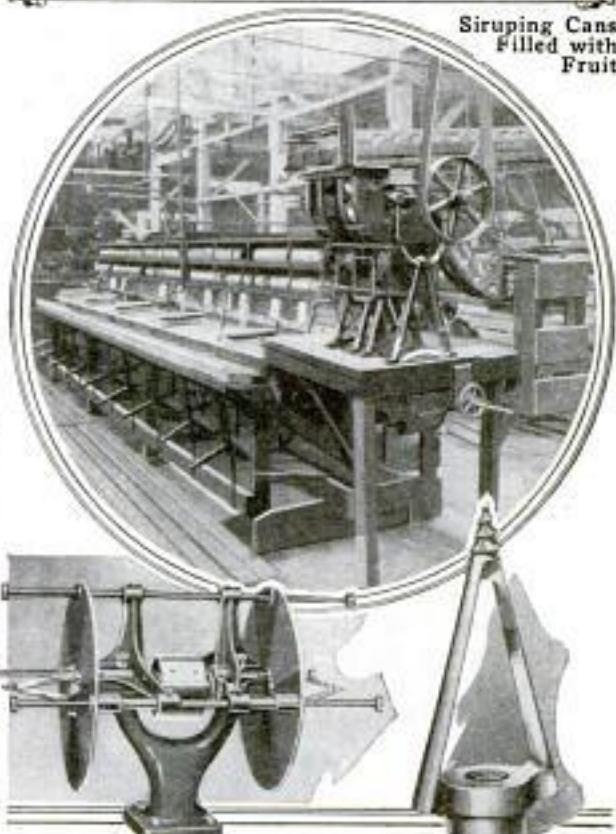
Rotating Disks That Remove
Pumpkin and Squash from the Rind.
Below: Battery of Steam-Jacketed
Sterilizing Kettles



stance that has formed on the surface is removed. Washing and filling the cans is the next step in the process, and the filling is done by machinery except in the case of products such as some fruits which cannot be handled by machinery because of the danger of crushing. Corn, peas, and other foods that are placed in the cans hot or are covered with a hot sirup, must be subjected to a treatment for exhausting the air, this process consisting in passing the filled cans through a steam box and heating the contents to from 160° to 180° F. Cans that require no solder are sealed by a special machine that crimps the lids into place at the rate of 1,800 an hour. For sealing cans with solder tops a machine is used that wipes the top, places the cap and applies the acid and solder in one series of operation, without the necessity for touching with the hands, at the rate of 5,000 an hour. As the cans pass from the capping machine



Siruping Cans
Filled with
Fruit



Cherry Pitter and Fruit-Washing Machine.
Below: Thousands of Cans of Salmon
Stored in Factory and Ready for Shipment



Machine That Distributes Cans to Filling Machines.
Small Machine Shown at Bottom Is a Cabbage Corer

they are dropped into a bath of boiling water to test for leaks. Any imperfections in the can or the sealing will be shown by bubbles issuing from the opening. The final step in the process is that of sterilizing, which is done after the can is sealed, and while this process is one on which the success of the whole work depends, it comes in the end simply to a matter of applying the right amount of heat

for the right length of time. With the product sterilized there is nothing left to do but apply the labels, which are placed on the cans at high speed by a machine. Modern canning standards require that the label shall tell the truth.

The average consumer is getting farther and farther removed from the sources of food supply, and as a rule, can no longer raise his own fruit and vegetables or buy from a neighbor's garden. This is especially true of the great cities, where so-called "fresh" products are often as much as a week old before they reach the consumer. The cannery makes it possible for the consumer to have such products fresh, not only "in season" but at any time of the year. One of the features of the enormous increase in the production and use of canned foodstuffs is its effect as a means of conserving our food supplies. It is becoming increasingly unnecessary to leave fruits and vegetables rotting on the ground for lack of transportation to the great central markets. Practically every district now has its cannery, centrally located so that the products of the garden and orchard can be delivered to it in fresh condition. Owing to the large scale on which canning operations are conducted, with resulting economy and efficiency, waste is largely eliminated, and many canned foodstuffs can now be served in the home at less cost than the fresh article. A can of whole apples weighing 35 oz., for example, usually retails for 10 cents. In a government report it is estimated that apples bought in this way cost less than apples bought by the peck at the rate of \$2 a bushel.

Many vegetables, such as corn and peas, can be bought in fresher condition and more cheaply in cans than in bulk, especially in the cities.

One of the disadvantages heretofore experienced in using canned goods was that the cans were too large or too small, with resulting waste in many cases. This fault is being remedied by the canners themselves through the introduction of cans of intermediate sizes. The attempt is being made, in particular, to provide cans that will hold just enough of different foods to serve for a meal for an average family of three or four without the necessity for any waste.

The biggest thing, after all, in the whole question of canned foodstuffs is its meaning to the housewife. When every kind of food can be obtained in as good and palatable condition in cans as in the fresh state, nine-tenths of the drudgery of the kitchen will have been eliminated. This condition has already been so nearly reached that the whole question is now practically up to the housewife. She must learn to make intelligent selection and to buy in packages of such size as to suit the needs of her own individual family. If the greatest economy is to be secured, she must buy by the dozen or the crate. She must learn costs and acquire the ability to watch the markets and take advantage of favorable cost conditions just as she would if she were conducting a commercial business. From present indications it is the acquisition of skill in these things, rather than skill in cooking, that will constitute the education and determine the efficiency of the bride of the future.

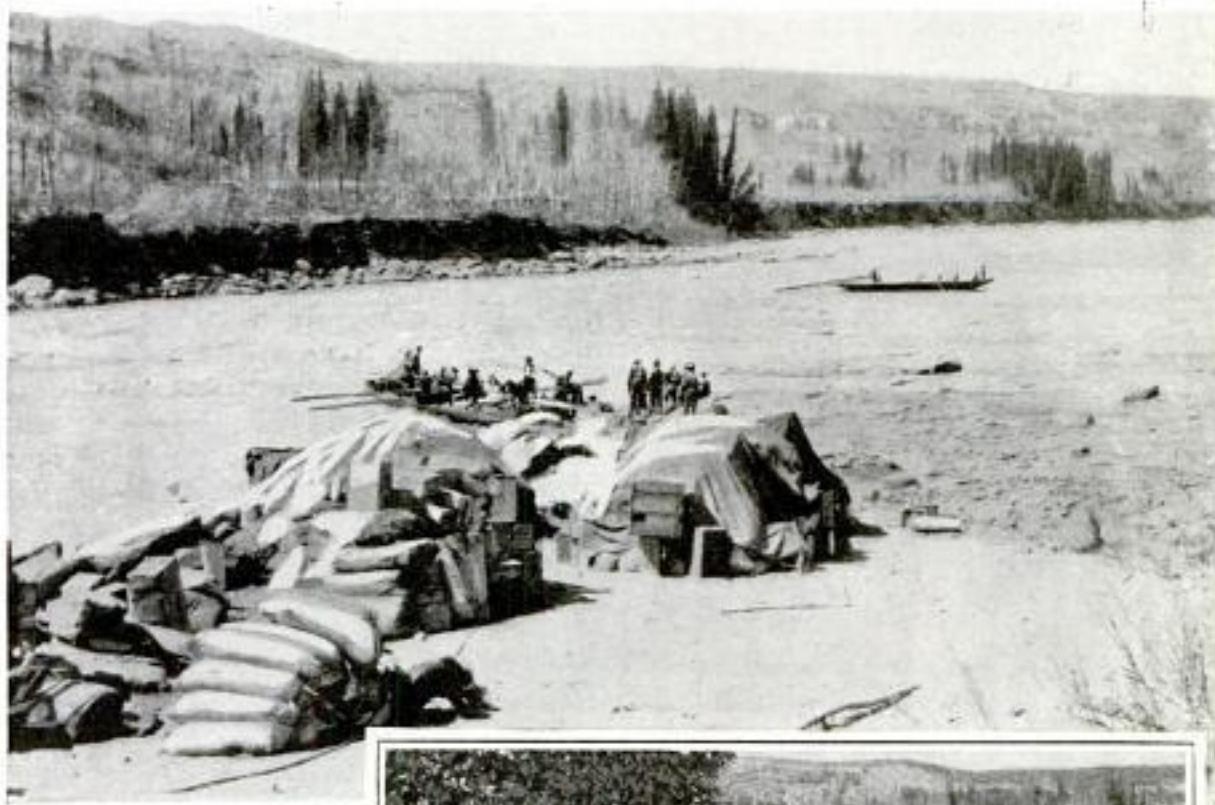
9322

QUARTER-MILE RAILROAD EARNS \$1,000,000

The shortest railroad in America and at the same time one of the most profitable is the Grand Island Railway, which constitutes the only rail link in the transcontinental trade route that connects Fort McPherson, on the arctic circle, with settled parts of Canada.

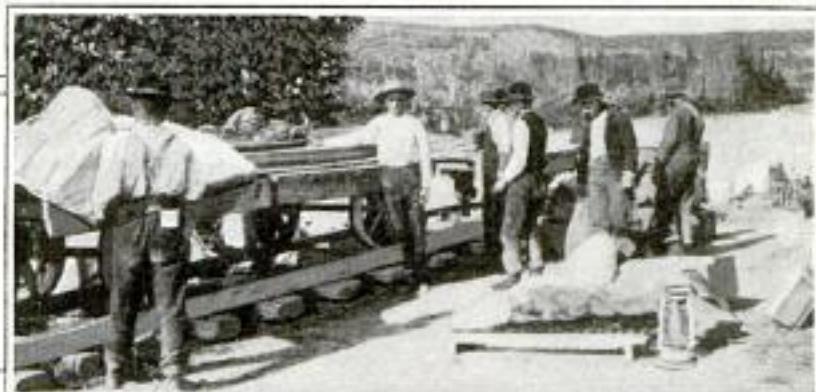
This curious railroad is owned and operated by the Hudson's Bay Company. It is a quarter of a mile long and cost less than \$800 to build, the rails being of wood, with strap-iron facings. The rolling stock consists of two dilapidated flat cars which are pushed

*Francis J. Dickie, 18 Hanover St.,
Edmonton, Canada.*



Freight Piled Up at the Lower Terminal of America's Shortest Railroad, Waiting for Scows to be Hauled Up for Loading

At Right:
The Entire Rolling Stock of the Road that Earned \$1,000,000 on an Investment of \$800, on Grand Island in the Athabasca River



by hand along the rails. The freight rate for all classes of commodities is \$2.50 a ton, and some idea of the volume of traffic can be had from the fact that in its 60 years of operation the Grand Island Railway has earned profits of more than a million dollars.

The secret of the road's commercial importance and success lies in the fact that it is the only means, other than "toting," whereby freight can be taken safely past the Grand Rapids of the Athabasca River. Except for these rapids, the river offers the shortest and safest route for the transport of trade goods into the interior and the bringing out of the furs for which the northbound freight is traded to the Indians. A hundred thousand dollars' worth of furs may be loaded on a single

scow at times, and the risk of loss is too great to justify an attempt to get the boat through without unloading.

The rapids have a fall of 65 ft. in a quarter of a mile, and while they can be "shot" by expert rivermen, few ever attempt it with a loaded scow. The railroad occupies a narrow island in the middle of the river. The scow crews handle all their own freight, running the empty craft down through the rapids after the cargo has been piled on the flat cars. At the lower end of the falls ropes are thrown to the men in the scows, which are hauled up against the current to the island by a winch. Up-bound boats are sometimes towed up the rapids, after discharging their freight, or carried up on the railroad for a fee of \$10.

Inventor: W. Sampson, Springfield, Mo.
Has made for only own use and for
a few friends.

662

POPULAR MECHANICS

motor age 1/14

ELECTRIC MINNOW NEW BAIT 9295 FOR GAME FISH

Intended for deep-water trolling for game fish such as bass, muskellunge and pike, as well as for night fishing,



an electric minnow has been made which represents a new kind of artificial bait. The inventor conceived the idea of a luminous bait by the fact that examination of the stomachs of these fish showed that they ate fireflies and other phosphorescent insects. The minnow is made of tin, celluloid, and a couple of pieces of cedar. Inside it is a miniature electric bulb, which is connected by a fine, insulated wiring that is held in the line. The fisherman carries a small dry battery in one of his pockets to which the

wires are connected. A switch on the pole near the reel allows the light to be flashed intermittently, as a glow-worm, so as to attract the fish. The hooks carried on the sides of the bait are detachable.

GREAT SPEEDWAY PROJECTED 8922 FOR TWIN CITIES

Financial arrangements have been made for the construction of a two-mile concrete speedway for St. Paul and Minneapolis, Minn., which if built in accordance with the present plans will be the greatest of its kind in America. A half section of land lying 4½ miles from the courthouses of each of the cities has been purchased for the site, where it is expected to expend \$1,250,000. The track will be 80 ft. in width, with a 50-ft. graveled safety zone on either side, and have a base of 12 in. of rock and 6 in. of concrete, laid in two layers. The grade of the course will run from 2 per cent on the straightaways to 35 per cent at the turns. The grandstand will be 3,225 ft. long and seat 76,450 persons, while the bleachers will accommodate an additional 30,000. Facilities will be provided for more than 50,000 motor cars.

ROSE-COVERED PEACE DOVE IN FLOWER PAGEANT

9324 One of the spectacular entries in a recent "Tournament of Roses" at Pasadena, Cal., was a "dove of peace,"



The Driver of the Car was So Nearly Hidden from View That the Dove Seemed to Move along the Street Unassisted

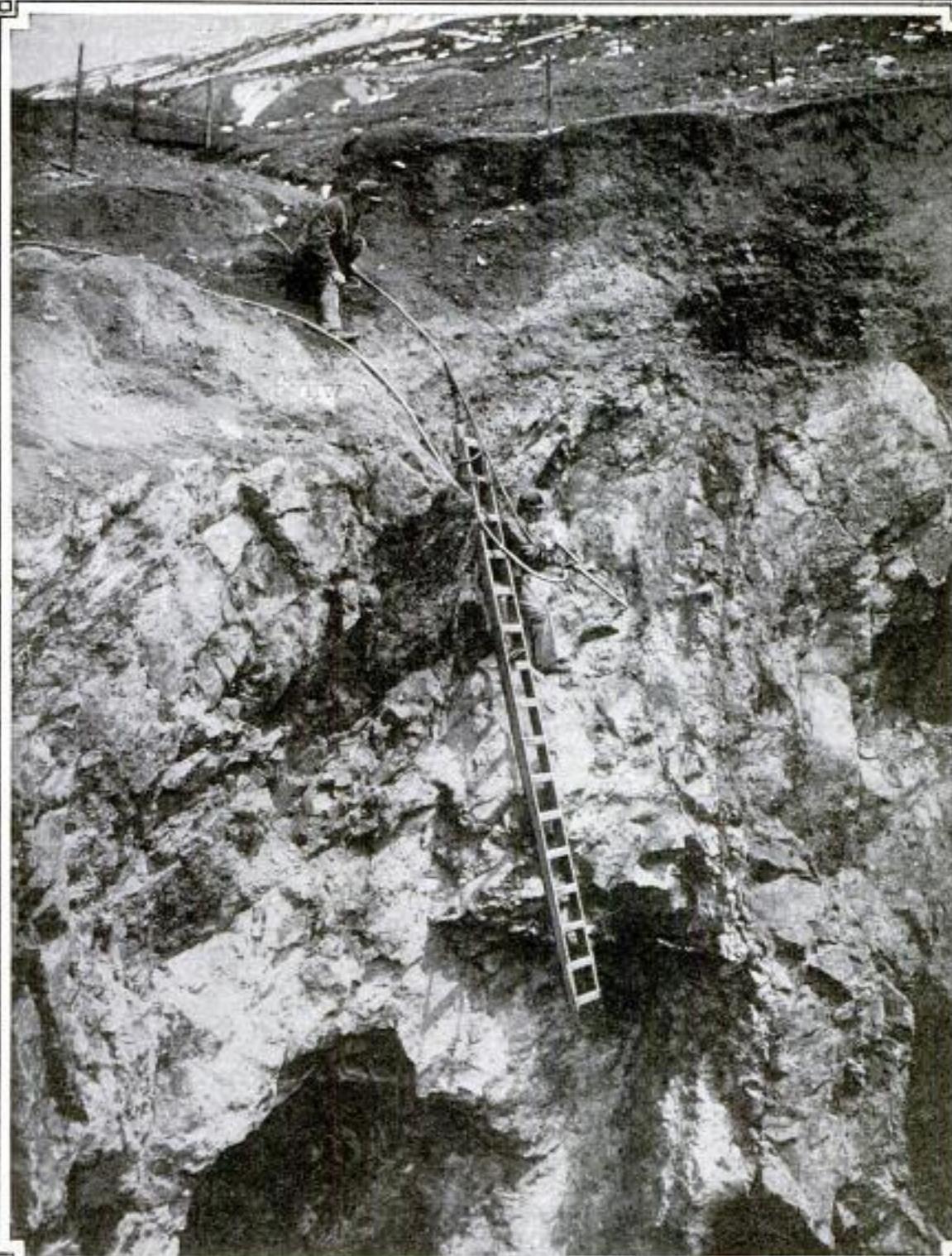
which was built over a small motor car. The framework forming the bird was completely covered with white roses and hid from view every part of the car except the two rear wheels. It was made with outstretched wings and held a green olive branch in its beak. The operator of the car was dressed in white and sat in such a concealed place that unless one looked carefully the "bird" seemed to be moving slowly along without human assistance.

C. L. Edholm, 1353 W. 36th Place,
Los Angeles, Calif.

Mining & Engineering World, 6/18/14
Bullwacker Copper Co., Butte, Mont.

GLORY-HOLE DRILLING IS A HAZARDOUS JOB

9312



COURTESY OF MINING AND ENGINEERING WORLD

OPEN-PIT or "glory-hole" mining, as it is termed, is in some respects even more hazardous than working in underground tunnels. Tripod drills for boring the blast holes in the sides of the cut are out of the question, since there is no base on which to place them, so the miner must use jack-hammer drills held in the hands. The photograph shows a miner drilling a six-foot hole with a jack-hammer drill in the glory hole of a Montana copper mine. The bottom of the hole is 75 feet below the surface and the slightest misstep would be fatal. Hollow drills worked by compressed air are used. The blasted rock falls to the bottom of the open pit.

R. H. Ross
R. H. Ross, Room 1085, 440 S.
Dearborn, Chicago, Ills.

664

POPULAR MECHANICS

GIANT MANIKIN IS MADE

9352 TO SING AND TALK

Having the ability to sing, carry on a monologue, wave her arms and move

her eyes in a circular orbit, a feminine manikin, nine feet in height, has been built by a Chicago decorator. The figure, a burlesque of the prophetic superwoman, is composed chiefly of wood, wire mesh, and wax, over which are added hair, paint, and silk. Concealed within the body is a phonograph and an

ingenious arrangement of wires and cords so strung as to provide for the ready movement of the head, arms, and eyes of the manikin. With perfect facial composure the creature will sing selections from "Aida," or whistle a street song while wildly swinging her arms about her head. Likewise the eyes may be moved soulfully to suit the particular selection which is being rendered.

AIRMAN GERSTNER'S DEATH 9495 CAUSED BY DROWNING

According to the testimony given by Captain Muller at the investigation of the aeroplane accident in which Lieutenant Gerstner of the U. S. Army lost his life near Oceanside, Cal., on Dec. 22, 1914, death was caused not by the fall of the biplane in which the two were riding, but came about as a re-

Scientific American



sult of the latter's attempt to swim ashore after the craft had made a landing on the sea. As the biplane fell Captain Muller, who was acting as pilot, kept sufficient control to bring it to a safe landing on the water, about half a mile from a deserted section of shore, but with the nose pointing seaward. An attempt was made to tear away some parts of the machine that would serve as floats to assist the airmen in swimming ashore. To do this required tools, which could not be obtained, as they were stored in a box securely wired to a submerged part of the craft. Lieutenant Gerstner then attempted to swim ashore unaided. After he had gone about half the distance he disappeared under the water. Captain Muller tied himself to the elevator wires of the biplane and was eventually rescued by boatmen.

STEEL FOR SOLDERING CAPS 9494 ON TIN FRUIT CANS

For use in small canneries, domestic-science schools, and homes in which

a considerable quantity of fruit or vegetables is canned, a small self-heating capping steel has been devised for soldering the covers on tin cans. The ordinary steel requires continual reheating, while the new device, which is made round so that it applies solder in a circle matching the circumference of the cap, has a small gasoline burner attached above it which keeps it constantly heated. The apparatus is intended to be clamped to the edge of a table in such a position that a can may be easily slipped beneath the capping steel. The soldering operation requires but a moment's time.

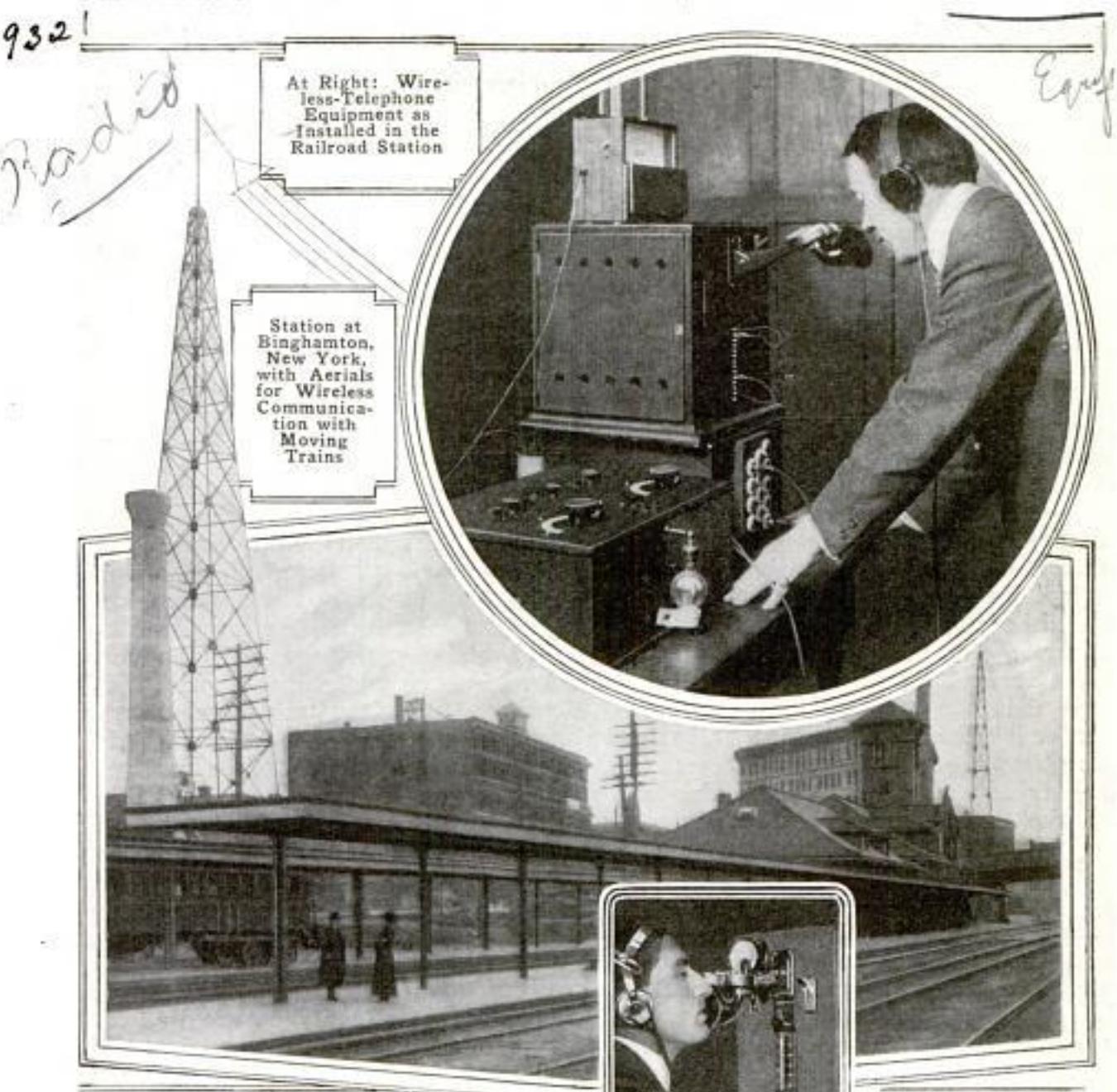
A metal X-ray tube, provided with a window through which to concentrate the rays, has been invented.

*mfg: The Home Canner Co.,
— Hickory, N.C.*

mfg: E. J. Flowers Copyrighted material

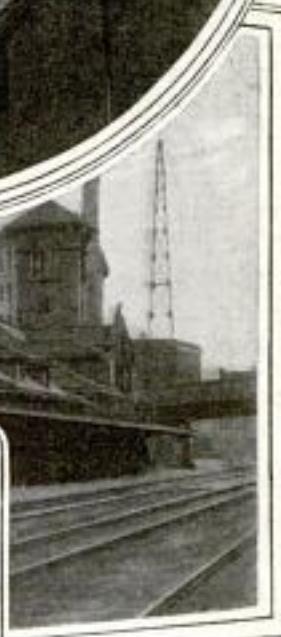
Dr. F. H. Milliner, Experimental Engineer
Union Pacific Railroad Co., Omaha, Nebr.

TELEPHONING BY WIRELESS FROM MOVING TRAINS



COMMUNICATION by wireless telephone between moving trains and the stations of a railroad, heretofore considered one of the hardest problems in the whole wireless field, has been brought to practically a working basis on two of the railroads of this country—the Lackawanna and the Union Pacific. One of the interesting things about this latest development in wireless is that while they accomplish practically the same purpose, the systems developed on the two railroads differ radically in most of their essential features.

On the Lackawanna Railroad the



Sending Wireless-Telephone Message from a Moving Train: To Listen, the "Listening Key" is Depressed, and When Speaking This Key is Released. Power is Supplied by a Generator Carried in the Baggage Car

wireless waves are transmitted directly between antennae carried on the train and the aerial at the railroad station, whatever the distance may be, while the system developed on the Union Pacific utilizes for distance transmission two wires strung on the telegraph

poles that parallel the track, so that the wireless waves are only required to bridge the gap between the telegraph line and the antennae carried on the train, a distance that rarely exceeds 75 ft. and is usually less than 50 feet.

That the system used on the Lackawanna is a success has been demonstrated by telephone conversations recently carried on over a distance of 27 miles between a limited train running at high speed and a wireless station at Binghamton, N. Y. The aerial carried by this train consists of four wires stretching over four coaches and running parallel with the roofs. When the train is made up, the wires of the four coaches are connected together so that the entire antennae system is close to 300 ft. in length. The telephone equipment is placed in a small booth at the end of the smoking car, while a small generator that supplies current for the transmitter is installed in the baggage car. This generator is driven by a turbine that takes its steam from the locomotive and exhausts down on the roadbed. Instead of the direct current ordinarily used in wireless-telephone transmission, a 110-volt alternating current at a frequency of 6,000 cycles is employed. The operation of this system is so simple that there is no necessity for the presence of an expert on the train. When the oscillator that sends out the wireless waves is once adjusted it is locked so that it cannot be tampered with. To listen, the "listening key" is depressed, and when speaking this key is released. Conversation at a distance of 27 miles is loud and clear, although somewhat affected by the noise of the train, while the sounds of the voice have been heard at a distance of 52 miles with the train running at 50 miles an hour. It is now planned to use an ingenious device by which conversation from the train can be relayed to the telephone lines of the city in which a wireless station is located. With this device the voice of the person speaking from the moving train will be registered on a phonograph record and instantly reproduced

and relayed over the telephone wire to the local telephones.

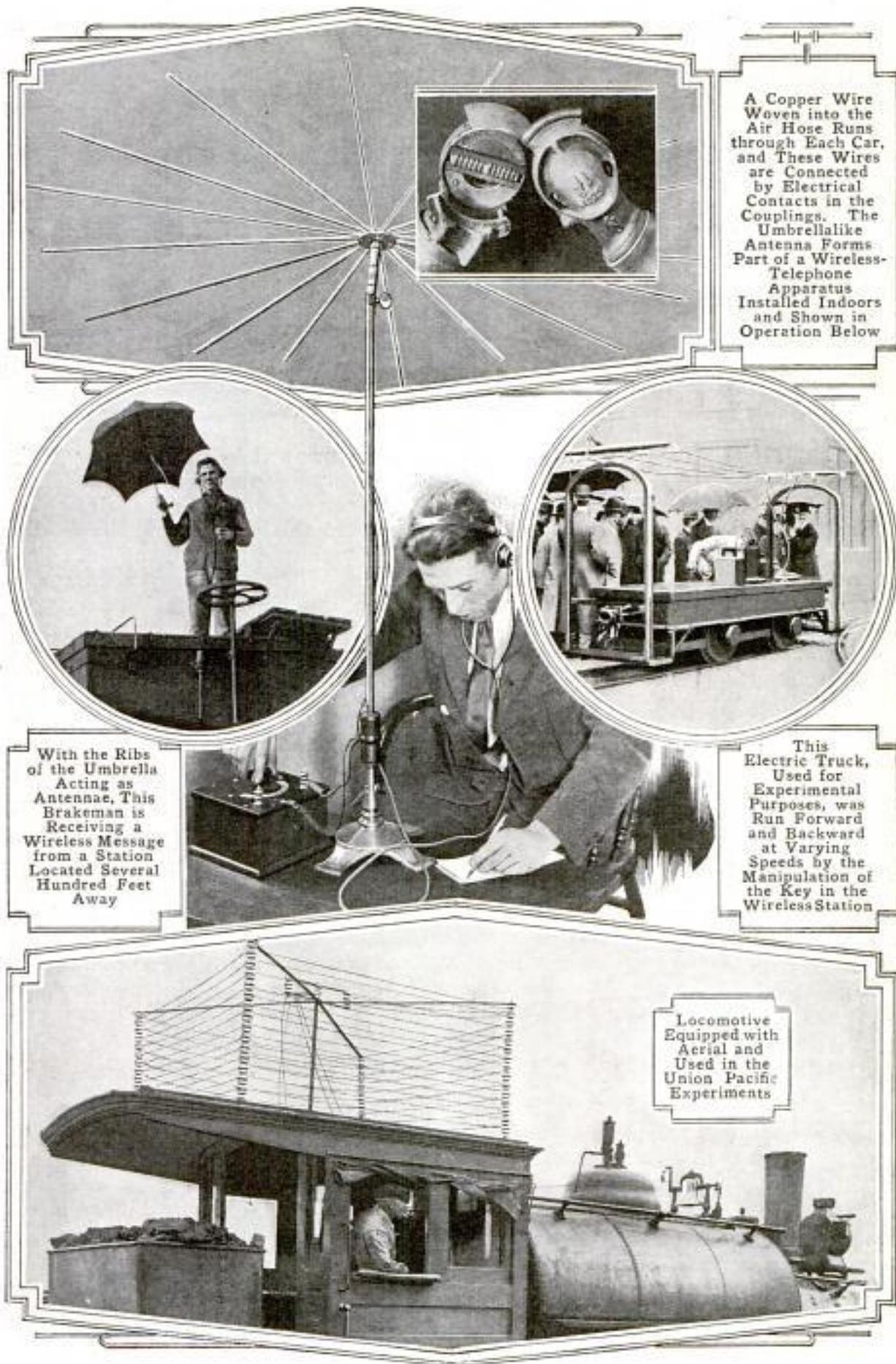
The system worked out on the Union Pacific is designed for talking both by wire and by wireless. It is used for communication between the different cars of the train, and it is then operated as an ordinary wire telephone with selective talking and signaling. When the train is stopped at a station, the equipment is connected with the wires of the telegraph line and is operated as a single long-distance telephone system. With the train in motion, the wireless is brought into action simply by starting the generator carried in the baggage car, and it is then possible to talk with a train ahead or behind, or with a fixed wireless station. The wireless waves thrown out by the apparatus are taken up by the two wires strung on the telegraph poles, these wires having been balanced and equipped with condensers. Over the wires the electric impulses are transmitted direct to the telephone equipment of the railroad stations, but at every point wireless impulses that can be picked up by another train are also thrown out by the wires, and it is this that makes communication between trains possible.

For connecting the equipment and making it continuous through the train, a copper wire woven into the air hose and grounded through the wheels at each end is used, the hose couplings being provided with metallic connections that interlock in firm contact when the couplings are made.

CIGAR WITH WOODEN PEG 9437 INSERTED IN TIP

A cigar manufacturer in Wisconsin equips each cigar with a small wooden shoe peg inserted in the tip and projecting far enough to be easily grasped by the teeth. Instead of biting off the end of the tip the smoker simply takes hold of this peg with his teeth and pulls it out, and in this way opens a good draft through the cigar without loosening or injuring the wrapper.

Mfrs: R. E. Holcomb, Monroe, Wis.
Chas. E. Gaper, 4322 Walnut St.,
Philadelphia *Patent material*



O.G. Geyer,
1429 West 9th St.,
668 Des Moines, Iowa.

POPULAR MECHANICS



Rescuing Fish Trapped in a Shallow Pool by the Receding Flood Waters of the Mississippi River

RESCUING FISH TRAPPED BY RECEDED FLOOD

Each year when spring freshets swell the Mississippi River, spreading it out over the lowlands for miles in every direction, millions of fish are carried out of the channel. When the flood waters subside the fish are trapped in shallow bayous and ponds. In order to prevent what was once a tremendous loss, the government has established fishery stations at different points along the river and sends its men into the field annually to rescue

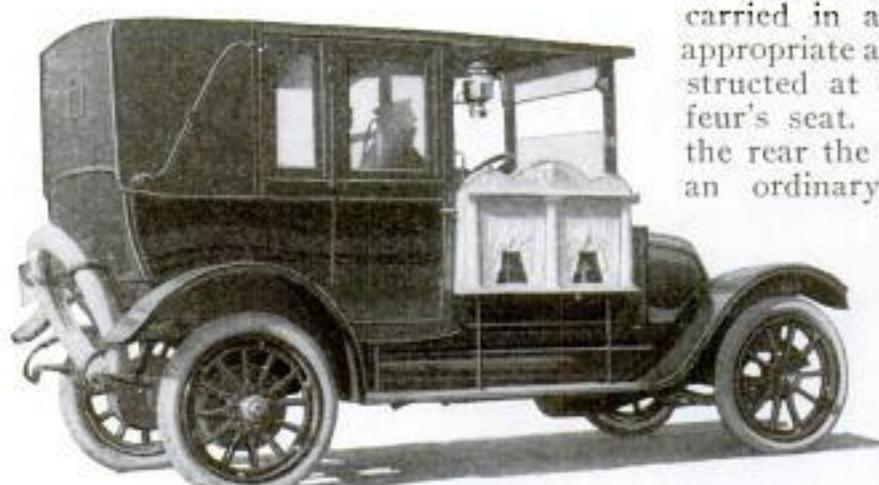
the fish trapped in this manner. The accompanying photograph shows one of the gangs seining in a shallow pool in which the fish would have died within a short time had they not been released. The greater percentage of the fish, the "fingerlings," are returned to the river, while millions of them are carried to the interior rivers which are in need of restocking.

Preliminary surveys are being made for a bridge across the Hudson River from New York City to New Jersey. The cost will be \$42,000,000.

TAXICAB HEARSE IS USED FOR INFANTS' FUNERALS

Taxicab hearses are the rather uncommon vehicles that have been intro-

duced at Chicago for use at children's funerals. One of these cars is designed so that an infant's casket may be carried in a boxlike receptacle of appropriate appearance, which is constructed at one side of the chauffeur's seat. The mourners ride in the rear the same as they would in an ordinary taxicab. From the driver's side the appearance of the car is no different from that of any ordinary motor vehicle. The vault in which the casket is carried is decorated in white and is similar to the full-sized hearses in style.



Taxicab Hearse, a Funeral Vehicle Designed to Carry a Child's Coffin

J. S. Reid, 506 Belden Ave.,
Chicago, Ills.

EXPLODING GUNPOWDER

9497 WITH WIRELESS WAVES

According to reports coming from Japan a wireless apparatus for exploding gunpowder at a distance proved successful in tests recently conducted at Kumamoto. Nothing is known of the apparatus except that it is intended "for the manipulation of wireless electric waves." For making the tests a double stockade was erected, a pound of explosive inclosed with wire netting was placed in one corner of the stockade and the exploding apparatus in the opposite corner. When all was ready the inventor pressed a key and, according to the reports, the explosion followed instantly. The distance was short, but the inventor claims that using the apparatus at greater distances is only a matter of greater power.

MOTOR-DRIVE ICE BOAT

9230 ATTAINS GOOD SPEED

On smooth ice a three-runner ice boat which during the winter has been used at Battle Creek, Mich., has attained a speed of 55 miles an hour with a twin-cylinder, 3-hp. motor, driving a 4-ft. 3-in. aerial propeller. The craft is guided by the fore runner, which is turned with an ordinary steering wheel. Beneath the driver's seat is a



Homemade Ice Boat Driven by a Three-Horsepower Motor

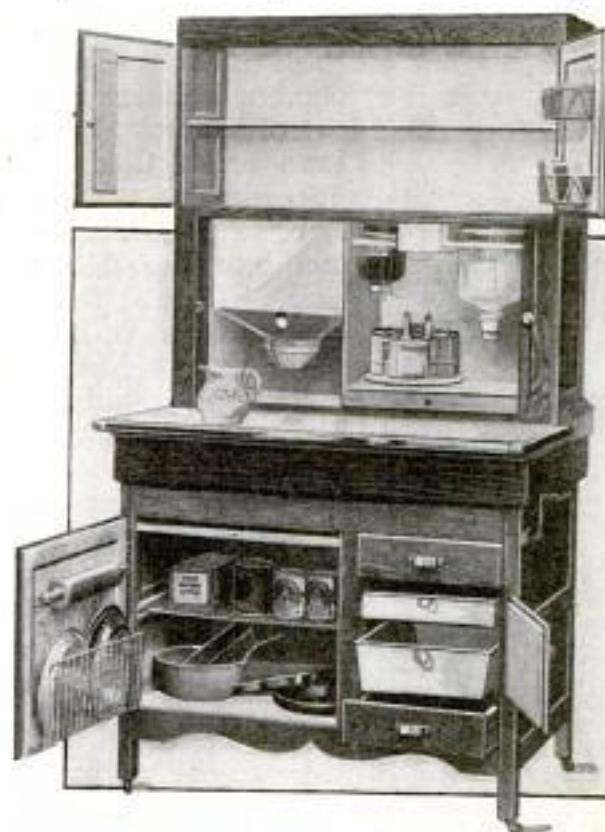
steel claw which digs into the ice and serves as a brake when pressure is applied with one foot on a lever at the front.

*Suzuki,
Battle Creek,
Mich.*

ADJUSTABLE WORK TABLE

9003 ON KITCHEN CABINET

A kitchen cabinet with a working table so devised that it may be readily adjusted to any convenient height



By Turning a Crank This Kitchen Cabinet may be Adjusted So That Its Working Table Is of Proper Height for Its User

has recently been invented. In general appearance it is similar to ordinary cabinets. At one side, however, it has a small crank that operates a ratchet-and-pawl mechanism which controls the working table, allowing it to be raised or lowered to suit its user. In this way a short woman, or a tall one, may have a cabinet which suits her height as satisfactorily as if it had been made to order. The adjustment may be made in a few seconds, and once fixed, the cabinet requires no further attention. It is as substantial as if it were of a fixed height.

DX-ray photographs on metal plates and celluloid films are being used by French military surgeons, being less likely to be broken than the glass plates.

*Greencastle Cabinet Co.,
Greencastle, Ind.*

LOOKOUT POSTS IN FORESTS OF MONTANA AND IDAHO

On many of the mountain peaks throughout the timbered areas of western Montana and northern Idaho, lookout points connected by telephone to the various permanent stations and patrol camps have been established by government forest rangers in order to facilitate the detection of fires at their inceptions when it is possible to curb them. In numbers of places where for some reason it has been impossible to construct regular stations, use has been made of the tallest pine trees. On each of these the branches have been stripped from one side, a ladder built up the trunk, and an observation platform constructed at the top. From such a point it is often possible, by the use of binoculars, to view the surrounding mountains for many miles. In this manner a vigil is kept over many of the most remote sections of the forests.

INSTRUCT MEXICAN LABORERS WITH THE PHONOGRAPH

The phonograph has been put to a novel use on a western railroad which employs many Mexican laborers who understand no language other than Spanish. To reach these laborers a "safety-first" talk was translated into Spanish, and a phonograph record of it made. A phonograph is carried on an inspection car and each Mexican gang of laborers is made to listen to a

Santa Fe Magazine
Jan. 1915



nine-minute talk in their own language. Extra records are carried, and whenever a bunk car is found with a phonograph as part of its equipment, a record is left so that the laborers may hear it repeatedly. In addition to these records the car also carries a number of Mexican musical records. When the car stops for the night at a point where a work train is tied up, a concert lasting for an hour is given for the benefit of the Mexican laborers and their families, and this concert invariably ends with the "safety-first" talk.

"TRIAL OF THE PYX" HELD AT PHILADELPHIA MINT

Periodically the coinage of all the United States mints is examined by the Federal assay commission, a custom which is also followed in other countries, and in England dates back to the time of Henry II. The procedure is known as the "Trial of the Pyx," a name derived from the sealed box, or "pyx," in which the coins to be examined are kept. In America it is the

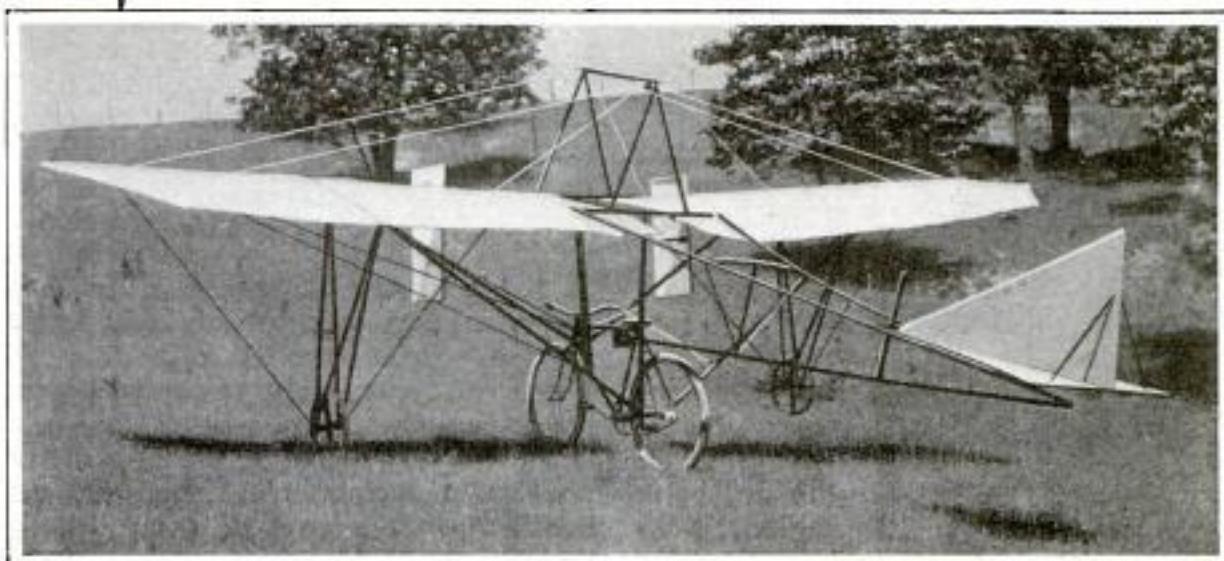
custom to preserve two coins out of each shipment amounting to \$1,000, for examination by the commission. This inspection is made to ascertain whether the coins are up to standard in quality and weight, which means that many of



them are subjected to both chemical and filing tests. In the course of this work, some of the coins are cut in half, as is shown in the accompanying photograph taken at the Philadelphia mint recently while the coin jury was undertaking its work.

International News Service
200 Williams St.,
New York City.

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By Pedaling the Bicycle Part of the Way down a Knoll, the Glider may be Shot into the Air so That It Skims Along for Several Rods

HOMEMADE GLIDER BUILT 9201 FROM SCRAP MATERIAL

From odds and ends of scrap material available for his use, an Ohio farmer boy has constructed a monoplane glider attached to a bicycle which fills quite adequately the purpose for which it is intended. To cover the framework of the wings, which are made principally of laths, its builder made use of pieces of canvas that had been used over tobacco-plant beds. The bracing wires were taken from an old fence, and a few other members were likewise reclaimed from scraps. By pedaling the bicycle rapidly part of the way down one side of a knoll, the rider is able to gain sufficient momentum for the glider to take to the air when its nose is pointed upward. By means of wires extending from the handlebars to the outer tips of the plane, the wings are warped and the craft guided.

coaster is shaped much like a toboggan, curving up at the prow in a generous scroll, and instead of being made from a solid slab of wood, it has a light frame covered with canvas. This furnishes it with a large air compartment, gives it buoyancy and makes it very simple to handle in the water. No skill is required in learning to ride the device, as in the case of the surf board, and for this reason it has gained popularity among winter tourists.

See Oct 13 - 467



SURF COASTERS INTRODUCED 8378 AT CALIFORNIA BEACHES

Surf coasters have made their appearance on the beaches of southern California and are being used there by the bathers in much the same way as surf boards are in Hawaii, and some other parts of the world where conditions are favorable for them. The

Toboggan-Shaped Coaster Which is Used for Surf Riding at California Beaches

A. A. Golismith
544 So Hobart Blvd.,
Elaine Stanford Los Angeles, Calif.

for sale by T. S. Shabot
425 So. Flower St., Los Angeles, Calif.
are sold in America

The Sphere 6-20-14

DESIGN OF SCOTT MEMORIAL 7978 DECIDED UPON

As a memorial to Capt. Robert F. Scott, commander of the ill-fated British expedition to the south pole,



COURTESY OF THE SPHERE

sculptors. The place of erection probably will be in Waterloo Place, in the heart of the city. The work consists of a granite pylon, at the top of which is a group of figures representing "Courage" supported by "Patriotism," disregarding "Fear" and "Despair." The names of the five explorers who failed to return appear on the front of the pylon, while other inscriptions are engraved elsewhere. A podium at the base carries on each of its four sides a bronze relief of the principal incidents of the expedition, with an inscription reading, "To Strive, to Seek, to Find, and Not to Yield."

AERATORS FOR NEW YORK 8837 WATER SUPPLY

A spectacular feature of the new water-supply system of New York City will be the devices used for aerating the water, one of which is being installed at Ashokan and the other at Kensico. With these the water will

be aerated just before entering the aqueduct and again before being distributed to the city mains. Each aerator consists of a basin covering nearly three acres, measuring 460 ft. in length and 240 ft. in width at the widest point. The floor of the basin is studded with 1,600 nozzles arranged in rows, and when the aerator is in full operation each nozzle will spout a jet of water from 15 to 20 ft. high. From each nozzle the water will issue in a fan-shaped, whirling fountain, and owing to the close spacing of the nozzles, the jets will intersect and break up into a mass of spray, giving the air access to every particle of the water.

RAPID STEEL CUTTING WITH OXYACETYLENE FLAME

The oxyacetylene flame was used in cutting down all the steel street-awning frames on the main streets of Baltimore, which had been ordered removed before a specified time to comply with a city ordinance. This method proved to be a great time saver, an average of only about 15 minutes being required to clear away

the frame in front of each establishment. In cutting down a frame, the two compressed-gas tanks, one containing oxygen and the other acetylene, were placed in convenient position on the sidewalk. The operator, armed with a stepladder and a cutting torch, attacked first the



horizontal members and then the upright posts. The posts were cut off flush with the sidewalk, the edge of each cut being melted down so there would be no projection. The average cut was made in less than half a minute.

*Alvin W. King, Payson Ave.,
Cantonville, Ind.*

*Scientific American
11-21-14*

J. C. McCarthy
9575
C. S. Wash. D. C.

LAUNCHING A GIANT BATTLESHIP A LONG-PLANNED AND RISKY JOB

By J. CROSBY McCARTHY

WHEN the "Pennsylvania," the biggest warship ever built in America, slid off the ways at Newport News on March 16 and floated safely in the waters of the James River, the huge craft passed successfully through the most critical stage of its construction—the launching.

To slide a steel structure as big as a 30-story office building downhill into the water and have it arrive right side up without damage is a big job, even in these days of big achievements: The builders of the "Pennsylvania" risked nearly \$7,000,000 worth of material and labor when the launching triggers were released. The outcome depended on the correctness of calculations made before the big fighting ship's keel was laid on the blocks, for before the first construction work on a ship is begun the preparations for its launching must be started. It is comparatively easy to build a ship on land, but to get it into the water is another matter, as Robinson Crusoe discovered after working seven years to construct a boat which, when finished, proved so big that he could not launch it. After the "Great Eastern," for 43 years the largest ship in the world, was built in 1858, it took three months to get it afloat.

The larger the vessel, the more ticklish is the job of sliding it safely into the water. Although years of experience and careful study have reduced the methods used to a standard practice, yet there is always a degree of uncertainty about the operation. In spite of the navy's record of an unbroken series of successful launchings, those responsible for each succeeding one experience considerable anxiety until the crisis is safely past. Even though every known precaution has been taken, there is always the chance that some unknown factor may ruin the plan and wreck the ship.

Data compiled from previous launchings of similar ships serve as the basis of calculation. In the case of the "Pennsylvania" the experience with the

"Oklahoma," launched a year before, was the guide. The "Oklahoma" is only 33 ft. shorter and weighs within 4,000 tons as much as the "Pennsylvania."

The construction of the ways, which carry the ship a distance of a little more than its own length into the water, is the most important of the launching preparations. The term "ways" includes both the pair of inclined wooden tracks along which the vessel travels, known as ground ways, and the skids, or runners, that support its weight while moving, called sliding ways. The ground ways for a big battleship are about 5 ft. wide, 70 to 90 ft. longer than the ship, and spaced about a third of the ship's width apart. They are built up of yellow-pine timbers a foot square, bolted together and supported on cribbing. A cross section of the ground ways shows a concave upper surface, the outer edges being about two inches higher than the center, and having wooden plates bolted to them to keep the sliding ways from slipping off.

The sliding ways are about two inches narrower than the ground ways and slightly shorter than the ship. Both the lower surface of the sliding ways and the upper surface of the ground ways are usually sheathed with 3-in. oak planking. Like the ground ways, the sliding ways are of foot-square timbers, bolted firmly, and above these is built up a packing of 4-in. pine planks, conforming to the curves of the ship's body and held in place by heavy iron rods and steel cables extending from the bulwarks completely around the hull. Between the sliding ways and the packing are placed oak wedges, 8 ft. long and 6 in. square at the thick end.

The "Pennsylvania," like most large ships, was launched stern first. This made it necessary to take elaborate precautions to insure against the crushing of the forward part of the hull at the moment when the stern floated, lifting the weight of the middle off the

ways and leaving the whole gigantic mass supported only at the two ends. This is one of the most serious dangers to be guarded against in launching a ship.

To prevent an accident of this kind, cradlelike supports, extending under the hull and known as poppets, are constructed. They consist of steel plates conforming to the curvature of the hull and supported by timbers resting on a curved rocker. Between the plates and the hull concrete is poured in order to insure a more uniform bearing. Between the two parts of the rocker grease is applied so as to lessen the friction when the vessel begins to pivot and pressure is brought on the poppets, which, because of their peculiar construction, serve as an axis when the stern starts to lift from the ways. The pressure brought on the forward part of the hull when the vessel pivots is so great that it is necessary to brace the hull from the inside where the poppets bear against it so that the plates will not be forced out of alignment during the launching. The sliding ways, poppets, and all of the packing, are tied to the vessel by means of ropes and cables, so that when the ship floats out into the stream it carries with it all of the cradle which supported it during the launching. When the ways are placed in position, a layer of stearin and tallow about three-quarters of an inch thick is placed between them. Iron plates, which are removed a few minutes before the launching, are placed between the ways at intervals of every few feet to prevent the lubricant from being forced out by the weight of the timbers.

The day before the launching the shores and braces which have supported the ship during the course of construction are removed. Several hours before the launching a force of 200, or more, men begin to drive in the hundreds of wedges between the sliding ways and the packing. Heavy mauls and hydraulic rams are used for this purpose. This setting of the wedges serves to lift the weight of the vessel from the keel blocks so that it is supported by the ways. The keel

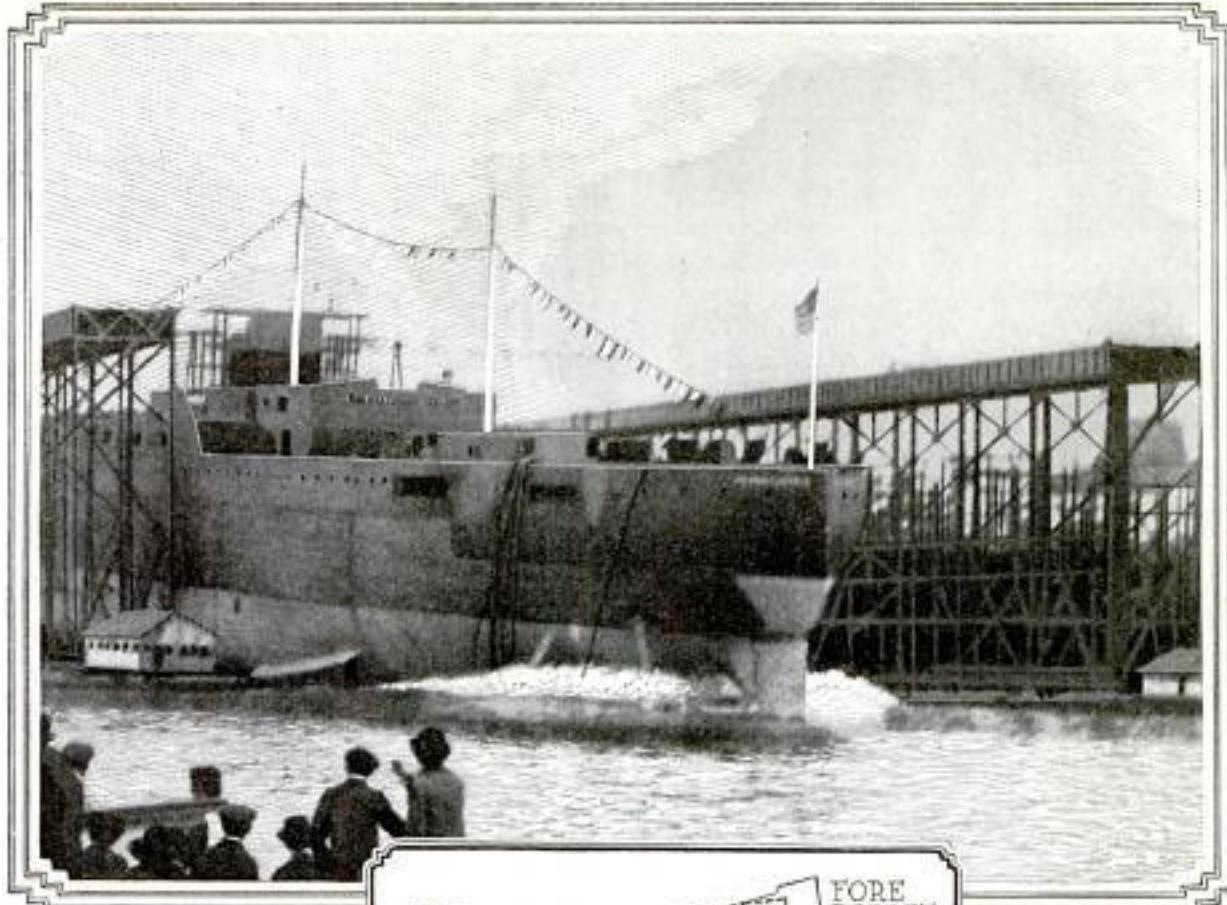
blocks are then removed and the ship is ready for launching.

A few minutes before the time arrives to send the ship gliding down the ways for its initial plunge into the water, dogshores which hold the sliding ways fast are knocked out, and the pressure is transferred to hydraulic triggers fitted in each of the ground ways about amidships. The triggers, which are of heavy steel, project through holes cut in the ground ways, the upper ends engaging iron caps fitted into recesses in the sliding ways. The bearings for the triggers are bolted to the under sides of the ground ways, and the lower ends of the triggers rest against the pistons of hydraulic jacks at a pressure of about 1,700 lb. to the square inch.

At a signal, the safety struts of the hydraulic jacks are swung aside and the escape valve in the pressure pipe is opened. The pistons recede into the cylinders, the triggers release the sliding ways and the vessel is free to slide into the water. Sometimes it is necessary to employ hydraulic jacks at the forward end of the sliding ways in order to start the ship. At first it moves slowly, but the speed rapidly increases until it reaches a maximum of as much as 25 ft. per second. The speed of the ship down the ways must not be too great, otherwise the friction will set fire to the lubricant. If this happens the vessel is liable to come to a standstill before it reaches the end of the ways. In order to retard the speed, rope checks are employed. Temperature is an important factor. If the weather is warm, the lubricant between the ways will be soft and the speed much greater. In extremely cold weather it has been necessary, in some cases, to lay steam pipes along either side of the ways to warm the lubricant.

Motion-picture cameras were used to make observations of the launching of the "Pennsylvania." The pivoting of the vessel is clearly shown on the films and the data obtained will be of great value in future launchings.

Larger than any other fighting ship ever built in America and exceeding



The Battleship "Pennsylvania," Largest Ship Yet Built for American Navy, Sliding into the Water at Newport News

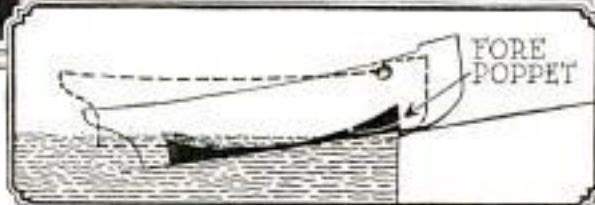
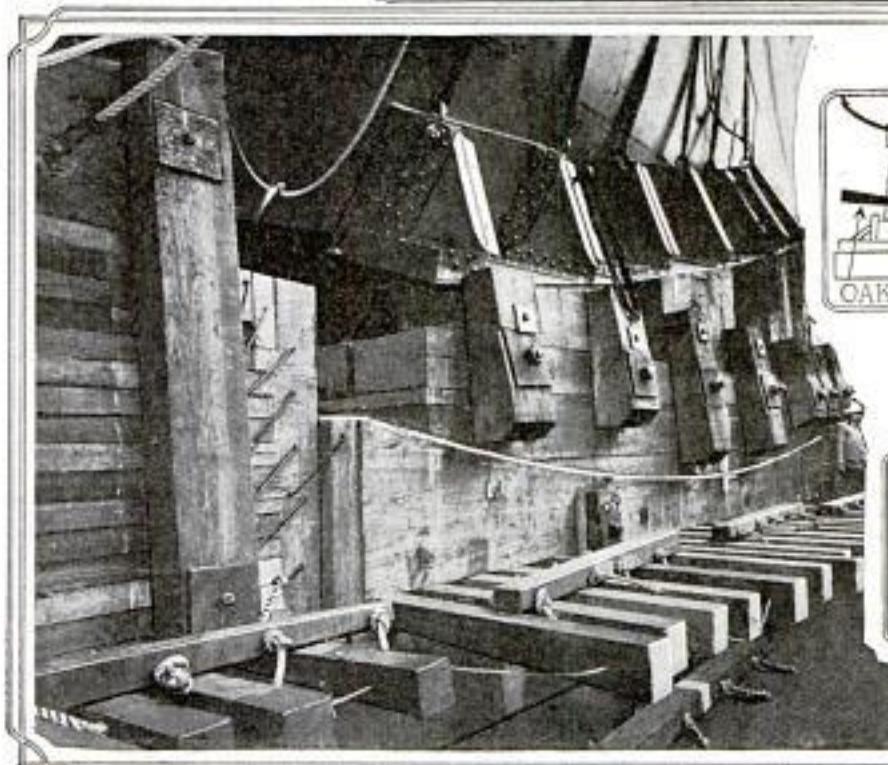
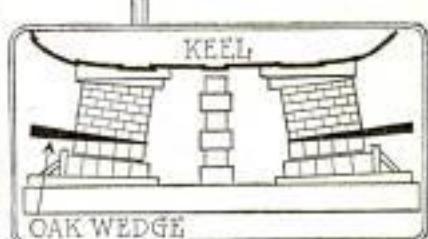


Diagram Showing How the Launching Poppet Serves as a Pivot When the Stern of the Ship Floats and the Angle of the Keel Changes toward the Horizontal



Photograph Showing the Forward Launching Poppet, Which Bears the Ship's Weight and Enables It to Change Its Position from Slanting to Horizontal. Note the Wedges between the Packing and the Sliding Ways



How Wedges between Packing and Sliding Ways Lift the Ship off the Keel Blocks Preparatory to Launching



Steel Launching Trigger Held in Place by Hydraulic Jack. When This is Released the Ship Begins to Slide to the Water

every other ship of any nation in the combined power of its great guns, the "Pennsylvania" was begun on Oct. 27, 1913, and will not be ready for active service until Feb. 28, 1916, so long does it take to construct a modern war craft. The new ship is 608 ft. long over all, 97½ ft. wide, 53 ft. 9 in. deep from keel to upper deck, and will draw 28 ft. 10 in. of water, displacing 31,400 tons. Curtiss steam turbines developing 32,000 hp. will drive its four screws, producing a speed of 24.2 miles an hour. Oil fuel will be used, the tanks in the ship's double bottom having a capacity of 694,830 gal. A band of 11-in. armor, extending nearly the entire length of the ship and 8 ft. below the water line, will furnish the main protection. The four turrets will have 15-in. armor. In each of them will be mounted three 14-

in. guns, 52 ft. 6 in. long. The turrets are so placed that the entire 12 guns of the main battery can be fired in a single broadside, or six can be fired at once dead ahead, and six dead astern. The combined weight of shells thrown at once will be 7½ tons. The secondary battery will include 22 guns of 5-in. caliber and 21 ft. 3 in. long, four 3-pounders for saluting, two 1-pounders for boats, two 3-in. field guns for landing parties, and two standard .30-caliber machine guns for the marines to use in the fighting tops on the two skeleton masts placed fore and aft of the single funnel. When in commission, the "Pennsylvania" will carry a crew of 65 officers, 863 enlisted men, and 74 marines. The hull alone cost \$7,260,000, and the completed ship, fully armed, will cost \$13,000,000.

q54 SOUND OF LIBERTY BELL IS PRESERVED

WHAT may prove to be the last ringing of the historic Liberty Bell took place in Independence Hall at Philadelphia recently.

Instead of sending the bell to the Panama-Pacific Exposition, it was decided to transmit its tones across the country to San Francisco over the recently completed transcontinental telephone line, partly fulfilling in a literal sense the prophetic words cast on the bell, "Proclaim liberty throughout all the land, unto all the inhabitants thereof." The bell was struck three times with mallets at intervals of five seconds. By an arrangement of three very sensitive transmitters which were suspended beneath it on rubber bands, so as to exclude all foreign vibrations, the tones were caught and clearly heard over the telephone wires on the Pacific coast. At the same time a phonographic record was made of the notes so as to preserve them for posterity.

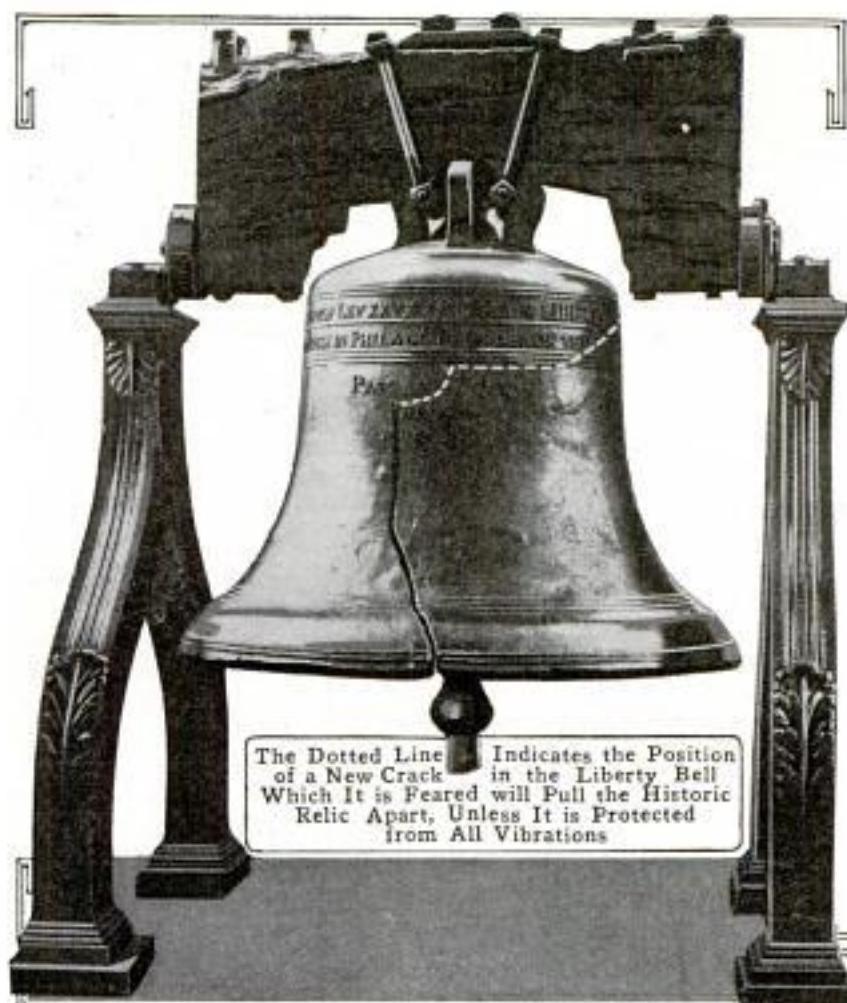
This is the first time that the great bell has been sounded since it was cracked in 1835 while tolling the death of John Marshall, the first Chief Jus-

tice of the United States Supreme Court. The reason that it may never again be rung is that a new crack, more serious than the old one, has developed in it.

It has been found that the bell is afflicted with the "disease of metals." This is partly responsible for the appearance of the latest fissure and has made it necessary to support the weight on padded props in order to relieve the stress which has gradually been pulling it apart.

The new crack is now plainly visible, while only a short time ago it was microscopic. It begins at the upper part of the original fracture, extending from the letter "P" in the word "Philadelphia," diagonally a quarter of the way around the circumference, to the letter "y" in "Liberty," near the top. It is believed that the new crack might not have occurred had the bell been allowed to remain at rest after it was first broken. It has, however, been shipped on different occasions to New Orleans, Chicago, Atlanta, Charleston, Boston, and St. Louis. That it is actually suffering from a malady known

*The Iron Age - 2/8/15
The Telephone News*



enced in the art, undertook the recasting in Philadelphia. Obviously the bronze was too brittle, and in order to toughen it, they added approximately 10 per cent of copper to the original metal. When the bell was later rehung it was found that too much copper had been used, and, to the chagrin of everyone, the tone was destroyed. The same men again undertook the work, and this time are supposed to have added tin to restore the tone. The third bell was accepted, but too much tin had been used, and the tones were so highly resonant that it was seldom rung.

as the "disease of metals," is the description of its ailment in the technical phraseology of the metallurgist, and is not a popular figure of speech. The reason for this dis temper is to be found in the history of the bell's casting.

It was originally made by Thomas Lester at London, in 1752, and shipped to Philadelphia. When it was hung to try the sound it was cracked by the clapper. At first it was intended to return it to England, but subsequently two workmen, Pass and Stow, neither of whom was experi-



Ringing the Liberty Bell for the First Time Since It was Cracked Years Ago. Below Are the Transmitters Used in Sending the Tones across the Continent. The Horn at the Left was Employed in Making a Phonographic Record of the Tolling

Newspaper Clippings

FAULTY CONSTRUCTION OF MONOPLANE 955] CAUSE OF LINCOLN BEACHEY'S DEATH

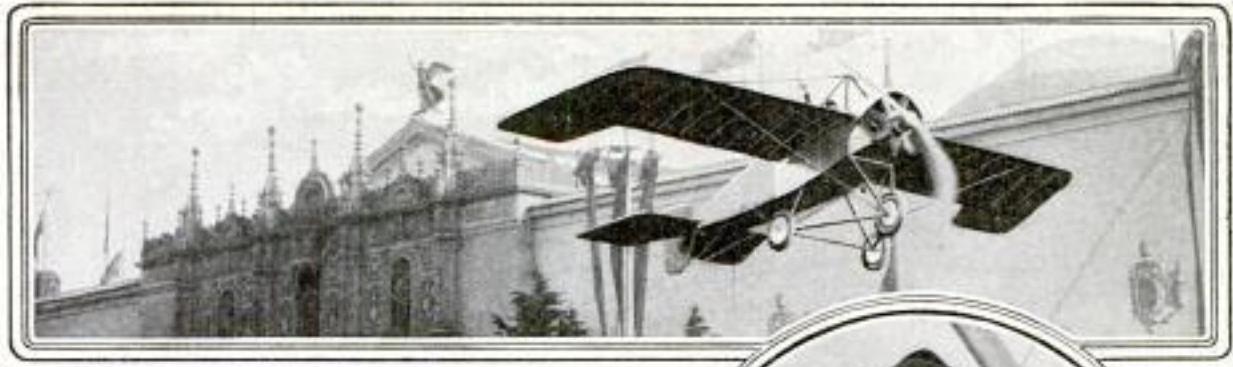
WHEN Lincoln Beachey, the airman, lost his life by a 3,000-ft. plunge into San Francisco Bay a few weeks ago, he proved his theory that the monoplane of today is not the logical machine for looping the loop and making spectacular drops from the clouds. His death resulted from the structural weakness of a new craft of this type, which was too light and poorly braced to withstand the stress of the 2,000-ft. perpendicular dive that he attempted to make in it. One of the wings crumpled while he was diving, head down, at a speed of probably three miles a minute.

The wing spread of the machine was only 26 ft. 6 in. It was not a German Taube, as is popularly thought, but a small tractor monoplane with ailerons extending back from the tips of the wings. The fuselage was short and the body made of aluminum, with an opening at the top just large enough to allow him to climb into the machine. Only the airman's head protruded above the hood when in flight. Beachey's fatal mistake lay in his over-eagerness for a light machine, for he neglected to brace the wings even as substantially as is customary on high-power monoplanes intended merely for speed and straight flying. He relied solely on two sets of bracing wires, or stays; one on top and the other on the bottom—a total of eight wires. Two of these wires extended from the center pylon over the body to the outer part of each wing, while beneath, the wires reached from the same wing points to the running gear. In this connection attention has been called to an additional weakness in the bracing, caused by the crossing of the under stays. This would have a tendency to induce a strain which would bend the wings longitudinally at the spar, instead of holding them against such a pull. In view of French, German, and English plans of monoplane construction, the inadequacy of this system of bracing is glaring. Practically all German single-decked machines have three pylons,

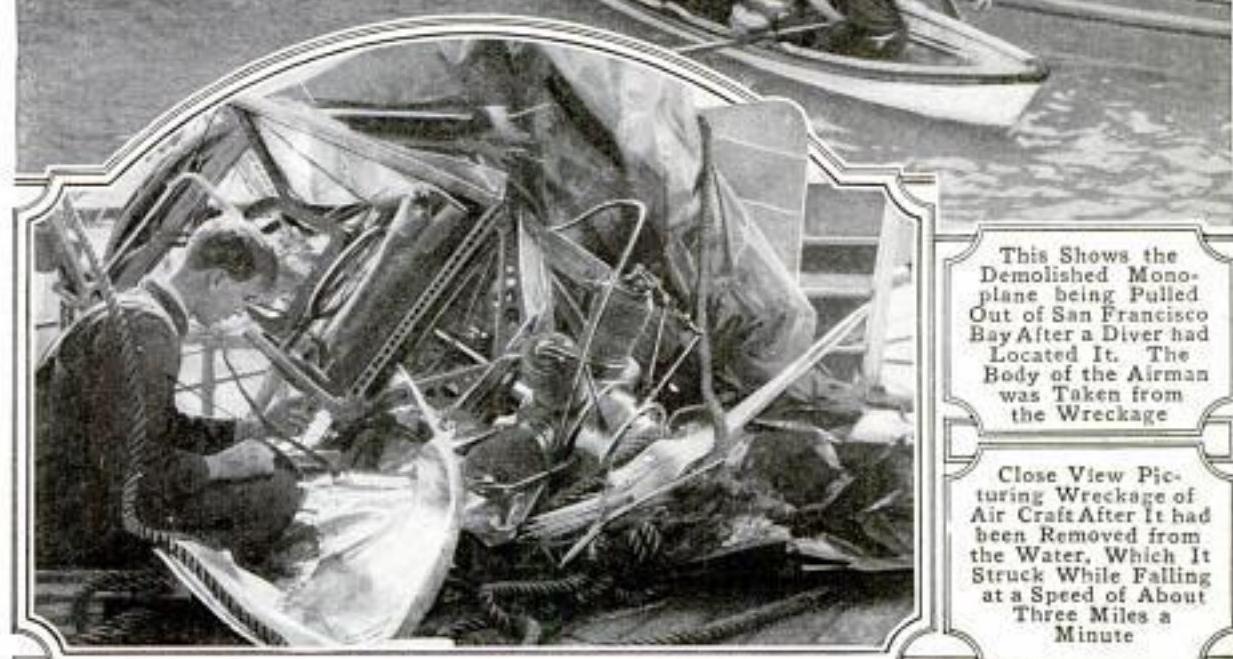
two of them midway of the wings, reaching through to form a similar post on the under side, and each carrying from six to eight wires both at the top and bottom of the plane, in addition to a truss extending nearly the full length under the front spar. And these machines are not intended for Beachey's type of flying.

Exactly what happened will never be known, but there is one theory that is quite plausible. Previously Beachey had performed his feats while seated on a slender outriggering at the front of his biplane where no part of his body was shielded from the air. Just as the marine navigator learns to measure the speed of his vessel by taking into account the effect of a heavy head wind, so did Beachey grow to estimate his speed by the force of the air against his body. When he seated himself in the cockpit of the new monoplane, however, covered his head with a tight-fitting hood and his eyes with goggles, this also for the first time, he was protected from the air in a way he never before had been. Therefore when he started on his long, head-first dive, after successfully looping the loop and flying upside down, he probably failed to realize that he was plunging toward the earth at a rate much greater than was his custom. There is no doubt about this point, for a monoplane meets less resistance than does a biplane and travels at a greater speed. In a few seconds his craft attained a terrific momentum and the stress was greater than it was capable of withstanding. The front spars of the wings were not braced against head resistance, neither were they reinforced with a truss, so, when he was within a thousand feet of earth and ready to straighten out and volplane to the green, the velocity of his craft was out of proportion to its strength and a wing crumpled under a stress heavier than formerly had been borne by the four wings of his biplane.

Chicago has an all-night movie theater.



Above,
Lincoln
Beachey
is Shown
Rising from
the Ground
at Start of
Flight



This Shows the
Demolished Mono-
plane being Pulled
Out of San Francisco
Bay After a Diver had
Located It. The
Body of the Airman
was Taken from
the Wreckage

Close View Pic-
turing Wreckage of
Air Craft After It had
been Removed from
the Water, Which It
Struck While Falling
at a Speed of About
Three Miles a
Minute

From the book: "Influence of
Radio-active Earth (in Slant)
Growth and Crop Production"
by H. H. Rusby, of Columbia Univ.

RADIUM FERTILIZER GIVES

9581 INCREASED CROP YIELDS

That radium as a fertilizing agent has a wonderful stimulating effect on plant growth and also imparts to vegetables grown under its influence added richness and sweetness of flavor has been demonstrated by Prof. H. H. Rusby of Columbia University. Doctor Rusby conducted two experiments with radium fertilizer, one on 100 acres of farm land at Northfield, Ohio, and the other on a 1½-acre garden plot at Nutley, N. J. In both cases the results were surprising.

The cost was not as great as might have been expected. It takes about 400 tons of radium ore to yield a gram of radium, and this quantity is worth, at the current market quotation, \$120,000, equivalent to a price of more than \$50,000,000 a pound. But the finely powdered residue of ore, remaining after all the radium possible has been extracted, still contains two or three milligrams to the ton, and it was with this waste material, obtained from the Colorado radium mines, that the experiments were made.

The radium-ore tailings were diluted with ordinary fertilizer and applied in the usual way in proportions of 25, 50, 100, and 200 lb. of radioactive substance to the acre. Five plots were made for each crop grown, one for each of the proportions of radioactive fertilizer, and one without fertilizer, as a control.

On the Ohio farm, pumpkins on soil

POPULAR MECHANICS

late corn showed an increase of 105 per cent; oats, potatoes, cucumbers, cabbages, and tomatoes all showed increases of over 50 per cent, and other crops increased from 20 to 50 per cent. In the New Jersey garden, melons showed a gain of 80 per cent; radishes, 70 per cent; turnips, 129 per cent, and nearly all other vegetables gave greatly increased yields.

DESIGN FOR "MADE IN U. S. A."

9528 TRADE-MARK SELECTED

A design that is characterized by the judges as being "simple, strong and mechanically perfect" has been selected as the prize winner in the competition held by the Detroit Board of Commerce for obtaining the best "Made in U. S. A." trade-mark. The qualities specified in the specifications governing the competition were that the trade-mark should not only be suited to printing by ordinary processes, but that it should be suitable for reproduction by lithographic or color processes, for printing as a textile label in colors, and for reproduction by zinc or copper processes in one color, and that it should be adapted to use as a stencil, metal stamp, or die. Above all, it was to be thoroughly American in atmosphere, composition, and color scheme. The winning design not only possesses all these qualities but can be reproduced clearly in a width of as little as $\frac{1}{4}$ in. It is to become the property of the people of the United States, and it



Prize-Winning Design for National Label, Arranged for Colors



The Prize-Winning Design as Applied with a Stencil



How the Prize-Winning Design will be Woven into Fabrics

treated with 100 lb. of radium fertilizer to the acre produced 135 per cent more by weight than on the untreated plot;

is expected that it will be adopted generally, the names of other cities being substituted.

Designed by: Jasper Harley Drash and Elowen Chapman. Address of C. C.: 106 Morningside Drive, N. Y. City. Copyrighted Material

COMMENT AND REVIEW

JUST now a lot of well-meaning people, but most inexperienced for the task attempted, are essaying to evolve various plans for a peace pact which shall end the present war. Would-be reformers who would not think of going into a county court on a trivial case without a lawyer, profoundly offer their services in the settlement of differences which, when they are adjusted, as some day they must be, will require the master legal and diplomatic minds of the world.

Premature Peace Plans

It is commendable in all of us to talk and work and throw our influence in every practical, sensible way in furtherance of permanent and universal peace, but ill-timed and inadvised efforts are merely the getting in the way of the firemen by people who honestly want to see the conflagration extinguished but who have no experience in handling the apparatus.

As terrible as the present conflict is, and regardless of who is right and who wrong, it would be an even greater calamity to hasten a premature settlement, which would be only a temporary abatement of the fever, and not a radical cure and restoration to normal, permanent health.



WE are all inclined to look up to the physically big man, not only literally, but there is always a certain presumption in his favor that he must be correspondingly strong mentally. People make room for him; they attach more importance usually to what he says than to the same words uttered by an undersized man. We unconsciously picture in our minds the bayonet charge and storming of the trenches as the work of large men. The boy dreams of having a football physique and little sister worships her big brother.

Other abilities being equal, the large man has a positive advantage over the small man. And yet many, if not the majority, of the great men of the world have been only of medium size, and not a few even undersized.

A certain large city in this country had for years made it a rule not to employ in its fire department any but large men. The result was a small army of athletes which never failed to cause a positive thrill whenever they went on parade. They distinctly represented the day of physical might.

For some years past the inventive mind has been busy, and very successfully, to produce apparatus which never tires, and calculated to transfer to a great extent the hard work from muscle to machine. The evidences of this evolution may be seen in even small towns everywhere, and now the fire engine drawn by volunteers and worked with hand brakes must be looked for in museums of strange mechanics of the past. In its place is the self-propelled gas-engined machine, carrying its own hose and capable of highly effective work with only two men; and ladder trucks by means of which one small man manipulating some short levers can in a few seconds raise great ladders to dizzy heights, or pour a deluge of water into tenth-story windows while standing in the street below. Hence it has come

The Medium-Sized Man

about that the man small of stature but nimble of body and alert of mind is not only the peer but often the superior of the giant in build. There yet remains some work for the big athletes, but it is growing less each year, and the man whom nature has not endowed with great physical strength is coming into his own.



SO many laborious tasks have been taken over by machines, and so far-reaching has been the area of occupation, that it is only by pausing and taking a good look backward we can realize the progress made in this direction. A new and remarkable labor-saving invention is flashed into view, it is the talk and wonder of all for a few days and then retires to give place in the public mind to another which in turn must yield to yet another. Was there ever such an age, and where and when will we reach the limit of human initiative? On the farm, in the household, on land and sea, in shops, and in the air, it is one continuous story of the mastery of mind over matter. Immediately any service assumes large proportions and is difficult, or dangerous, or specially tiresome to perform, just so quickly the laws of mechanics and science, under the direction of brilliant minds and tireless energies, are concentrated on the problem. And like a piece of ice under the focus of a burning glass, no matter how cold the day, the problem melts and yields to a force it cannot resist.

What at first are expensive luxuries, under the pressure of demand soon become daily necessities, to be produced and sold at a price within the reach of thousands. The man who invents and he who by reason of study, experiment, and organization finds the way to manufacture a helpful article for a dollar which otherwise would cost ten to make—these Doctors of Mechanics—are doing a work for humanity in every way no less valuable than anything accomplished by our famous doctors of medicine.

It affords a positive relief to turn our thoughts from the weary depression of war to that helpful, hopeful progress which moves steadily, irresistibly onward and upward.



A RESIDENT of Georgia, who is at the head of a very large mercantile business, said to me the other day: "Inability to sell our cotton has worked a great hardship to the South, but in the end

*We Learn
from
Experience*

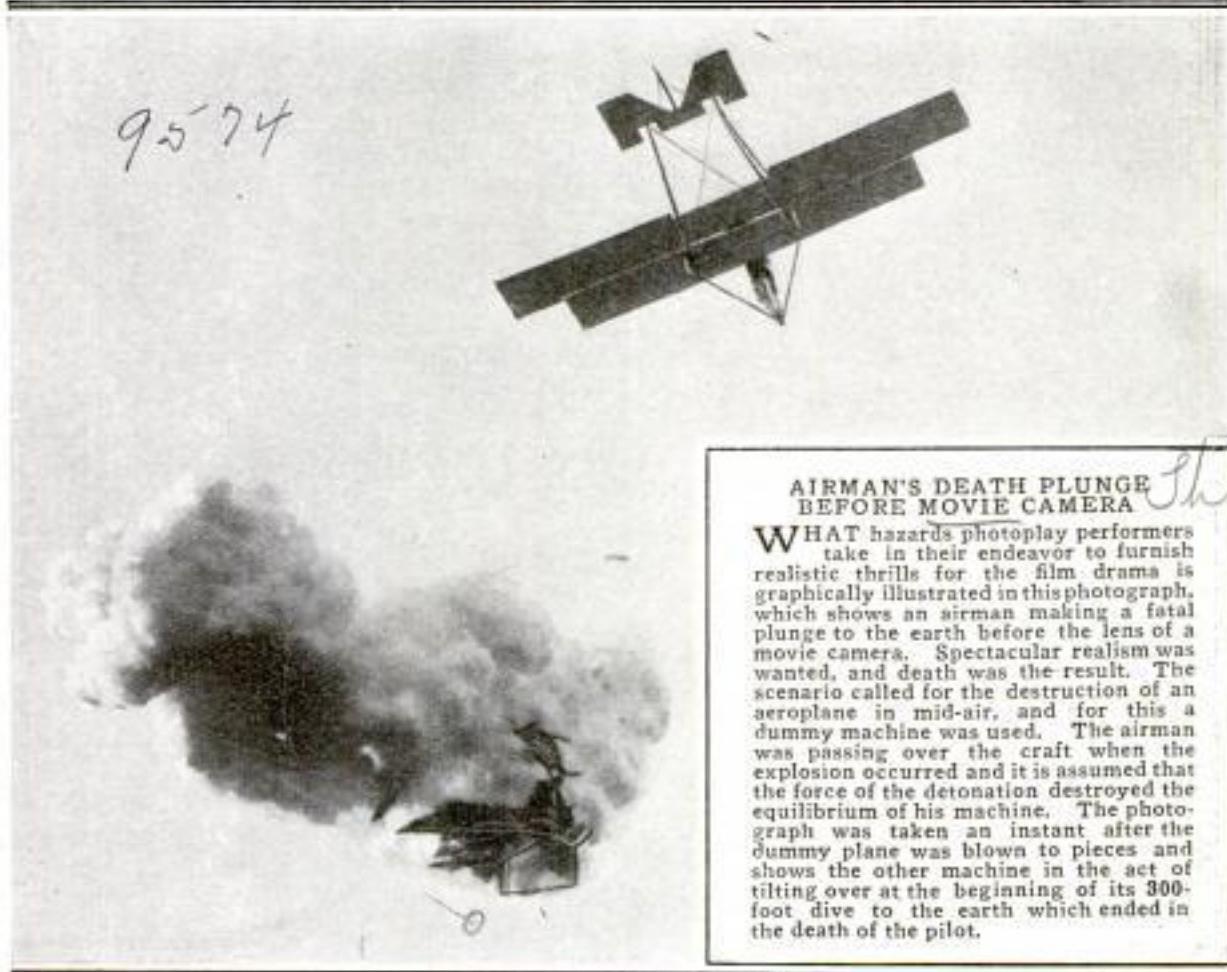
it will prove a great benefit. For years our state agricultural colleges have urged the planting of more diversified crops, but their advice fell mostly on deaf ears. We felt secure in that old, comfortable, but now exploded boast, that we could build a stone wall around this country and live on just about the same.

An almost total failure of the cotton crop even would not have worked the desired result, because any one staple could not fail every year. And now the flash light is turned on millions of bales of as fine cotton as ever grew, which must remain in storage until

Mr. Demand returns. And so our planters are figuring what they could have made with more corn and oats. It will take two or three, perhaps more, crops before our people learn how to approach the big corn production of the northern corn belt, but that the average production per acre can be doubled, by different planting and more cultivating, is already assured. The planting now determined on includes more food products than ever before, and a good share of this harvest will not be shipped as grain, but will be fed to pork and beef stock. The industrial departments of the railroads have done a splendid work in encouraging boys in the raising of corn, and where the average farmer was satisfied with 15 to 18 bushels per acre the boys have produced as high as 100 to 110 bushels from one acre. This of course was highly intensified production stimulated by the hope of winning some of the handsome prizes offered by the railroads, but nevertheless served as an actual demonstration of possibilities, and when reduced to the practical performance of large tracts shows returns which are highly profitable. The South will remain the cotton field of the world, but from now on it will grow millions of grains and other foods."

March 31, 1915.

H. H. WINDSOR

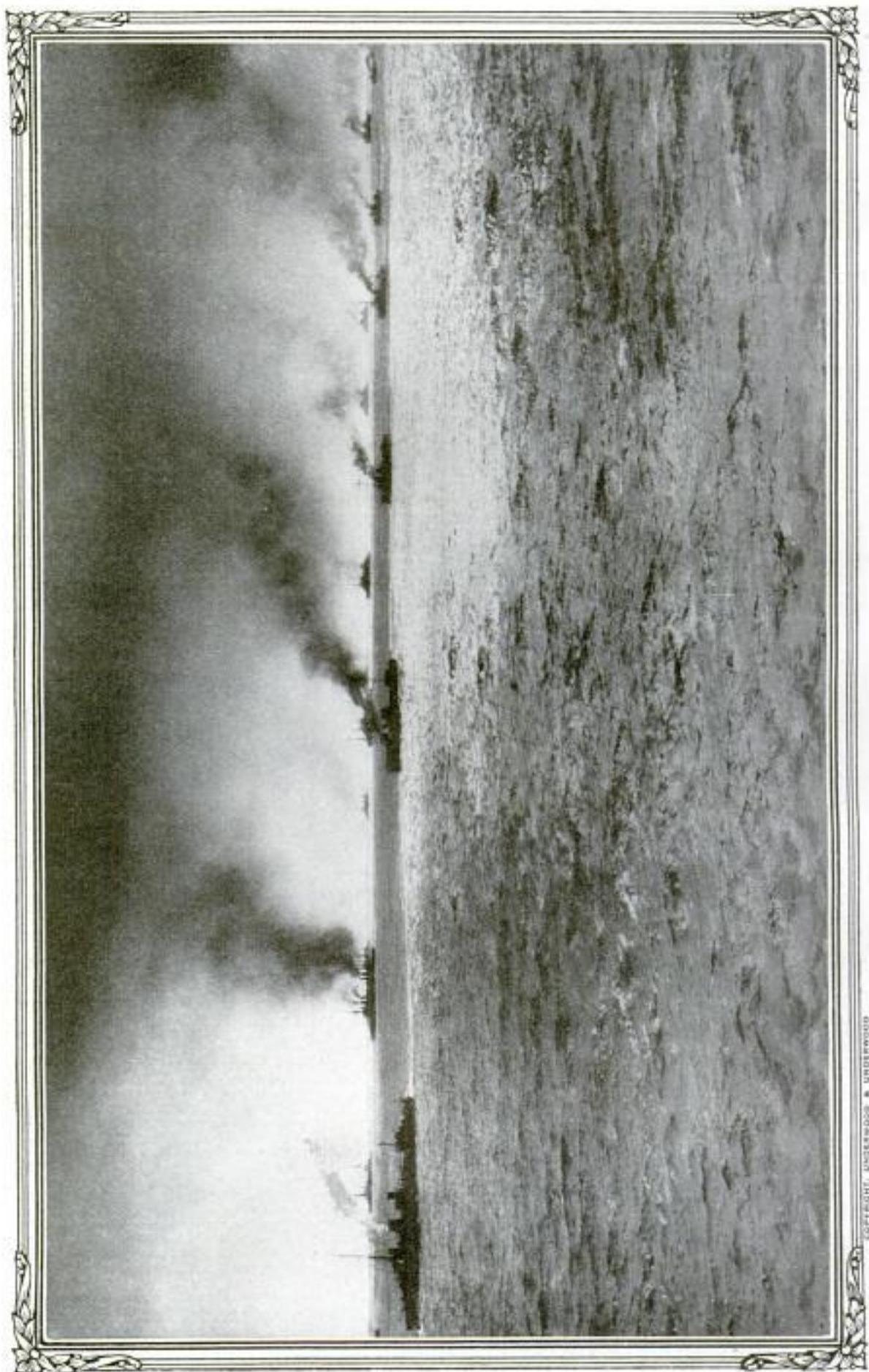


Shaded

AIRMAN'S DEATH PLUNGE
BEFORE MOVIE CAMERA

WHAT hazards photoplay performers take in their endeavor to furnish realistic thrills for the film drama is graphically illustrated in this photograph, which shows an airman making a fatal plunge to the earth before the lens of a movie camera. Spectacular realism was wanted, and death was the result. The scenario called for the destruction of an aeroplane in mid-air, and for this a dummy machine was used. The airman was passing over the craft when the explosion occurred and it is assumed that the force of the detonation destroyed the equilibrium of his machine. The photograph was taken an instant after the dummy plane was blown to pieces and shows the other machine in the act of tilting over at the beginning of its 300-foot dive to the earth which ended in the death of the pilot.

ALLIED FLEET AT ENTRANCE OF DARDANELLES



This Remarkable Photograph Shows Part of the Allied Fleet in Battle Formation at the Entrance of the Dardanelles Shortly before the Bombardment of the Outer Defenses. It was Taken from Aboard the French Battleship "Bouvet," Which was Subsequently Sunk by a Mine during the Engagement before Erenkoi

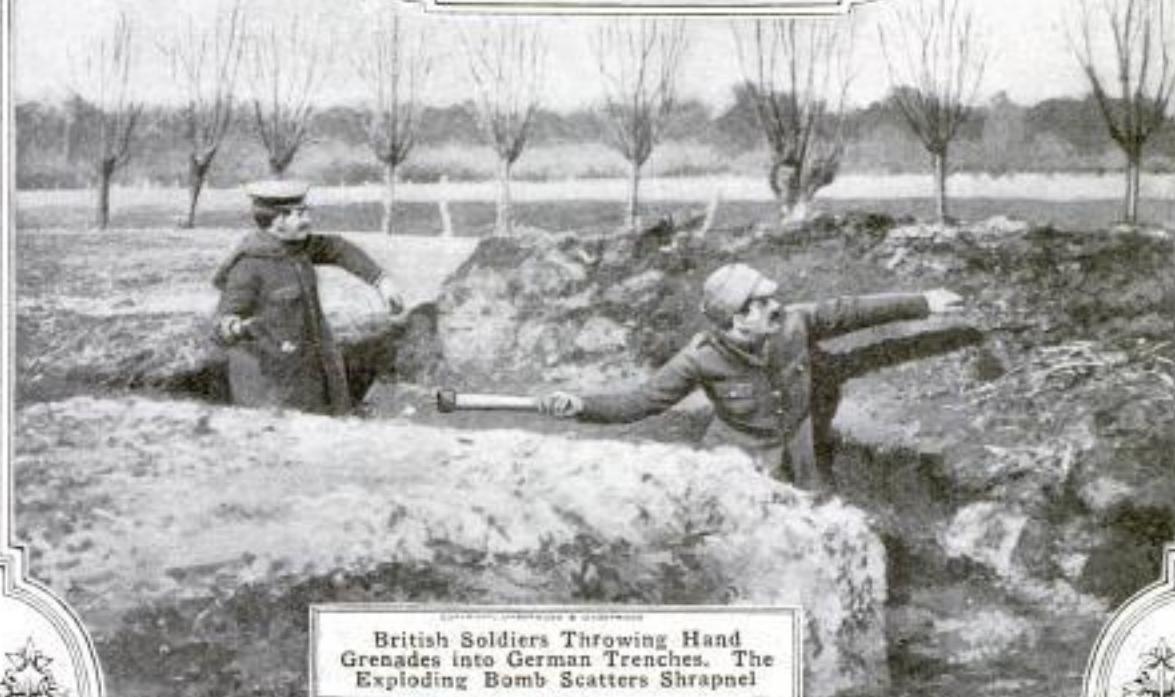
STRIKING SCENES IN CONTINENTAL TRENCHES



An Army Dentist Extracting a Tooth for a German Soldier in a Snow-Lined Battle Trench in Poland

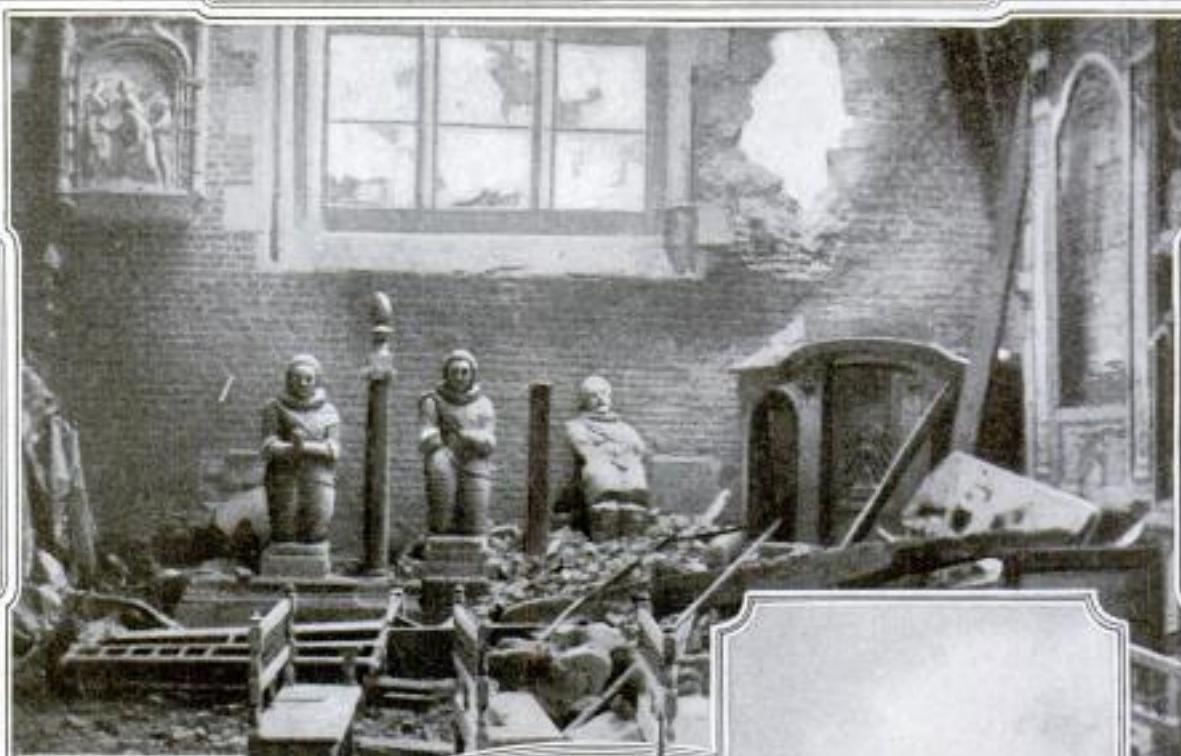


Austrian Defenders of Przemysl Burying Their Dead Back of the Lines after a Spirited Russian Attack

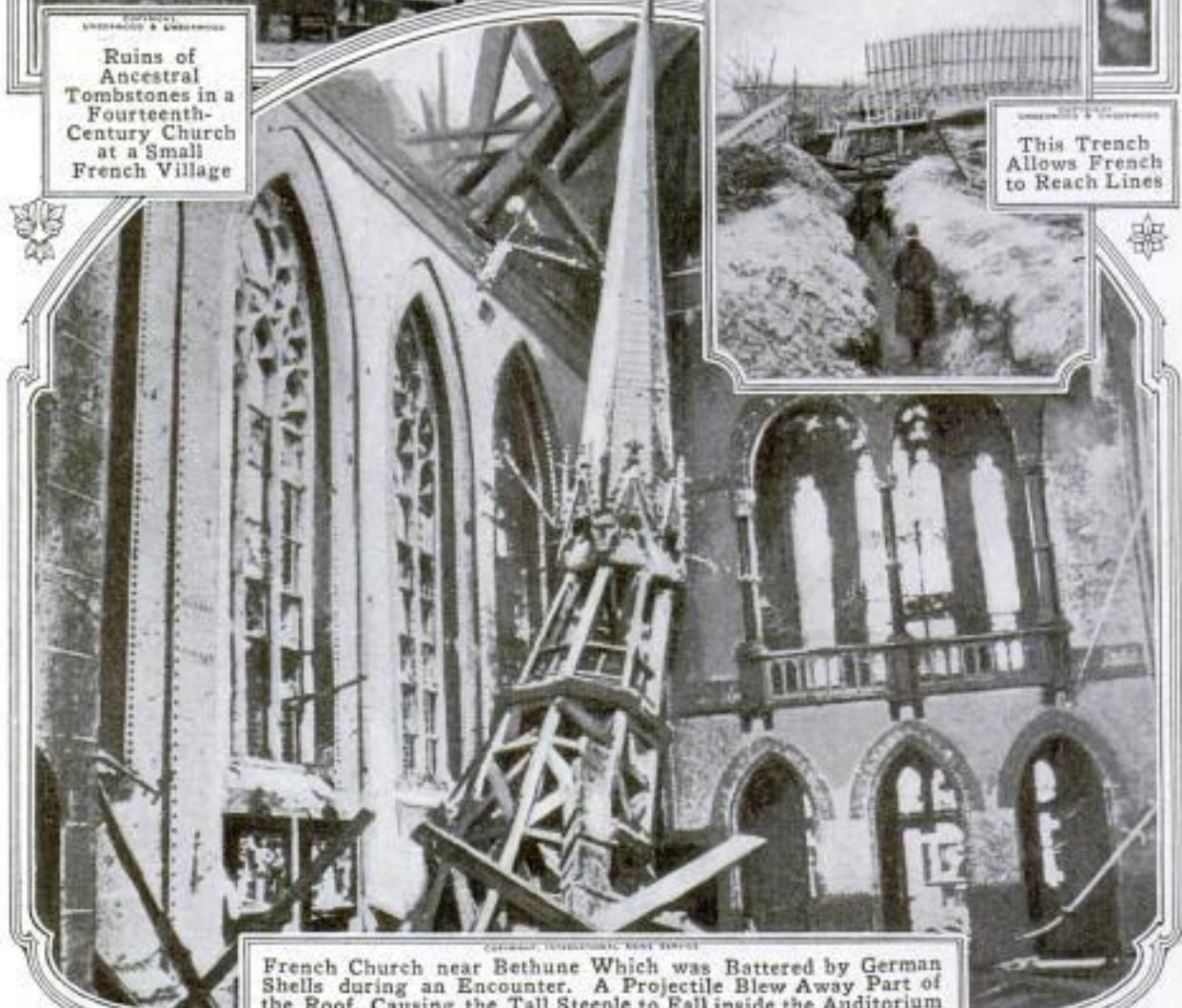


British Soldiers Throwing Hand Grenades into German Trenches. The Exploding Bomb Scatters Shrapnel

FRENCH CHURCHES DESTROYED BY GERMAN GUNS



COURTESY
UNDERWOOD & UNDERWOOD
Ruins of
Ancestral
Tombstones in a
Fourteenth-
Century Church
at a Small
French Village



COURTESY, INTERNATIONAL NEWS SERVICE
French Church near Bethune Which was Battered by German Shells during an Encounter. A Projectile Blew Away Part of the Roof, Causing the Tall Steeple to Fall inside the Auditorium

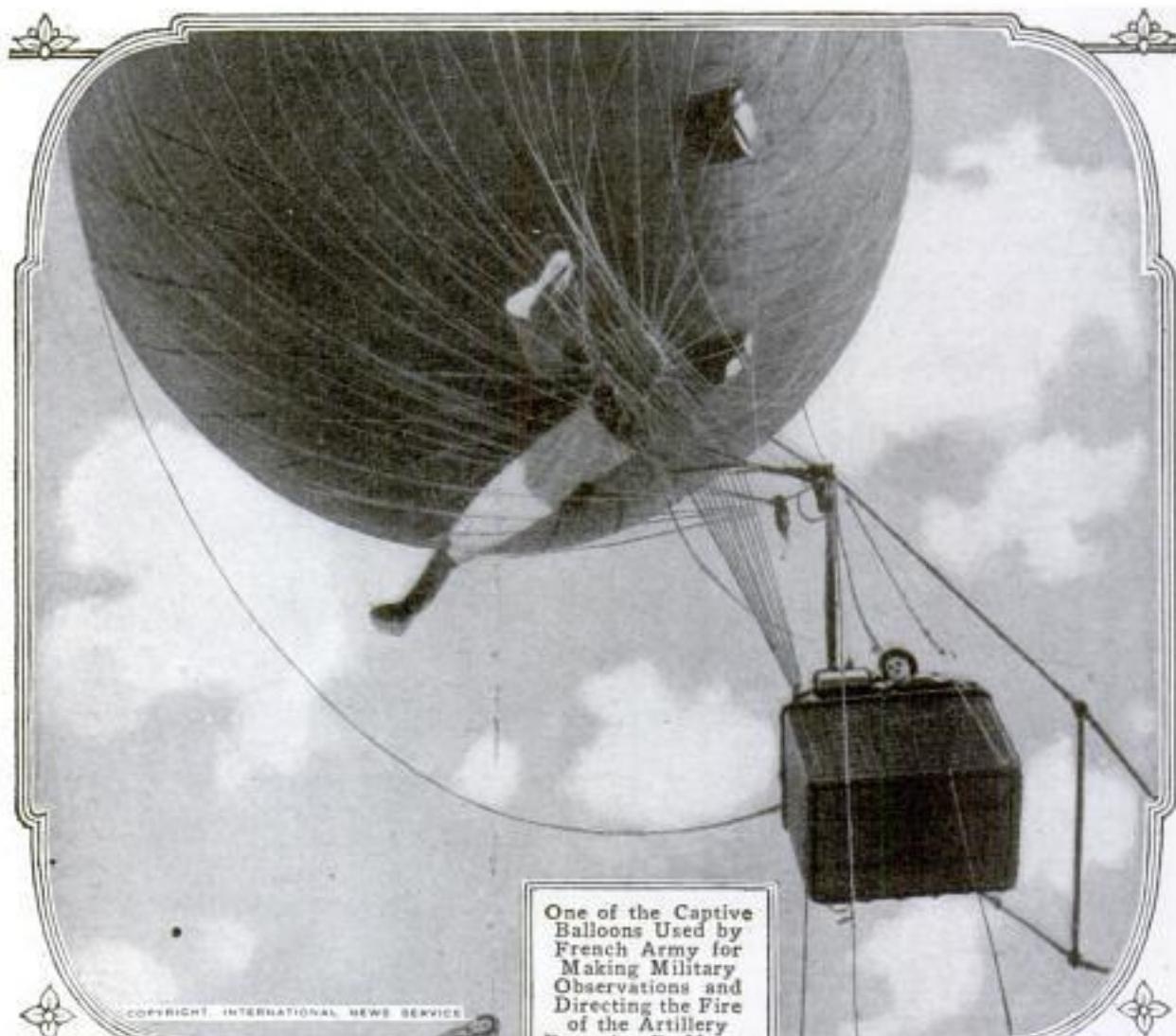


COURTESY
UNDERWOOD & UNDERWOOD
This Trench
Allows French
to Reach Lines

PARTS PLAYED IN THE WAR BY BOYS AND DOGS

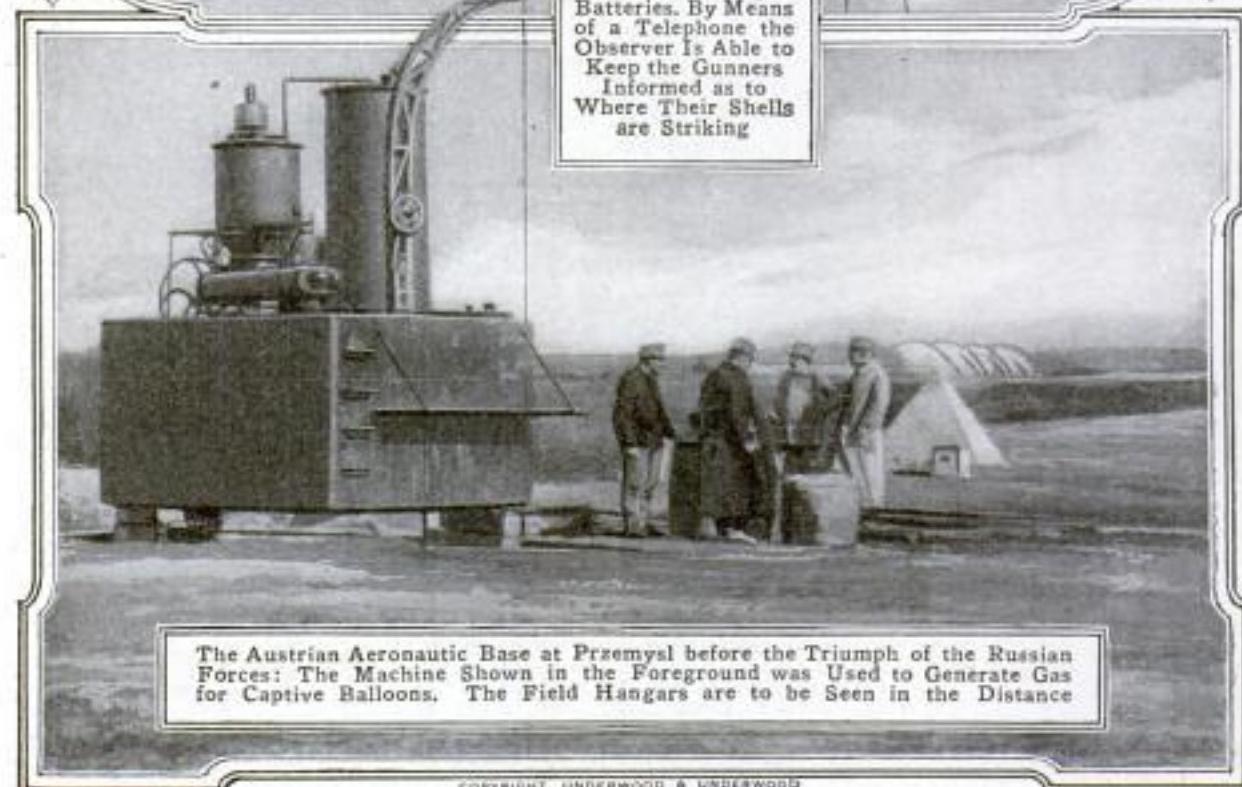


MAKING OBSERVATIONS FROM A CAPTIVE BALLOON



COPYRIGHT, INTERNATIONAL NEWS SERVICE

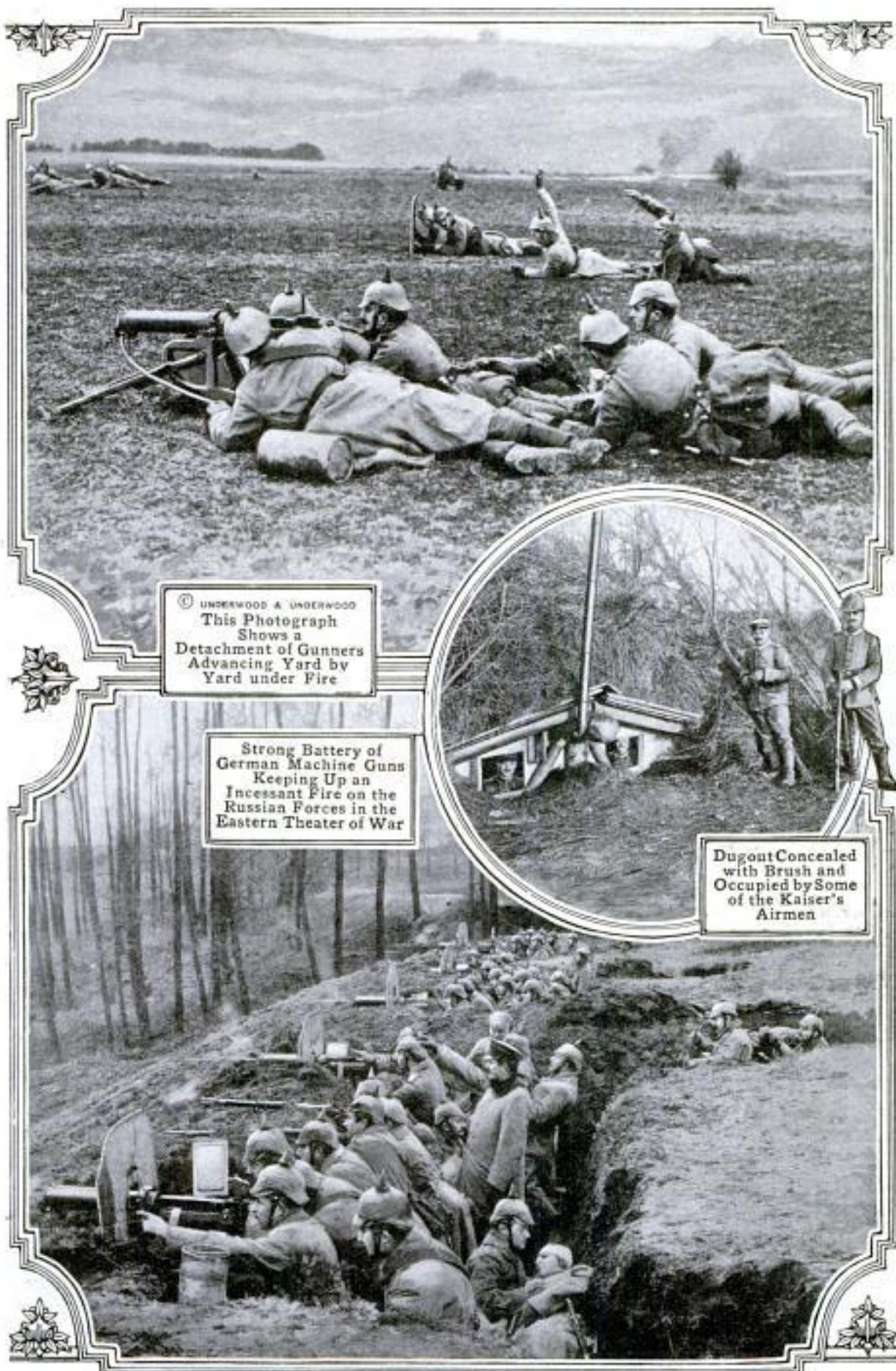
One of the Captive Balloons Used by French Army for Making Military Observations and Directing the Fire of the Artillery Batteries. By Means of a Telephone the Observer Is Able to Keep the Gunners Informed as to Where Their Shells are Striking



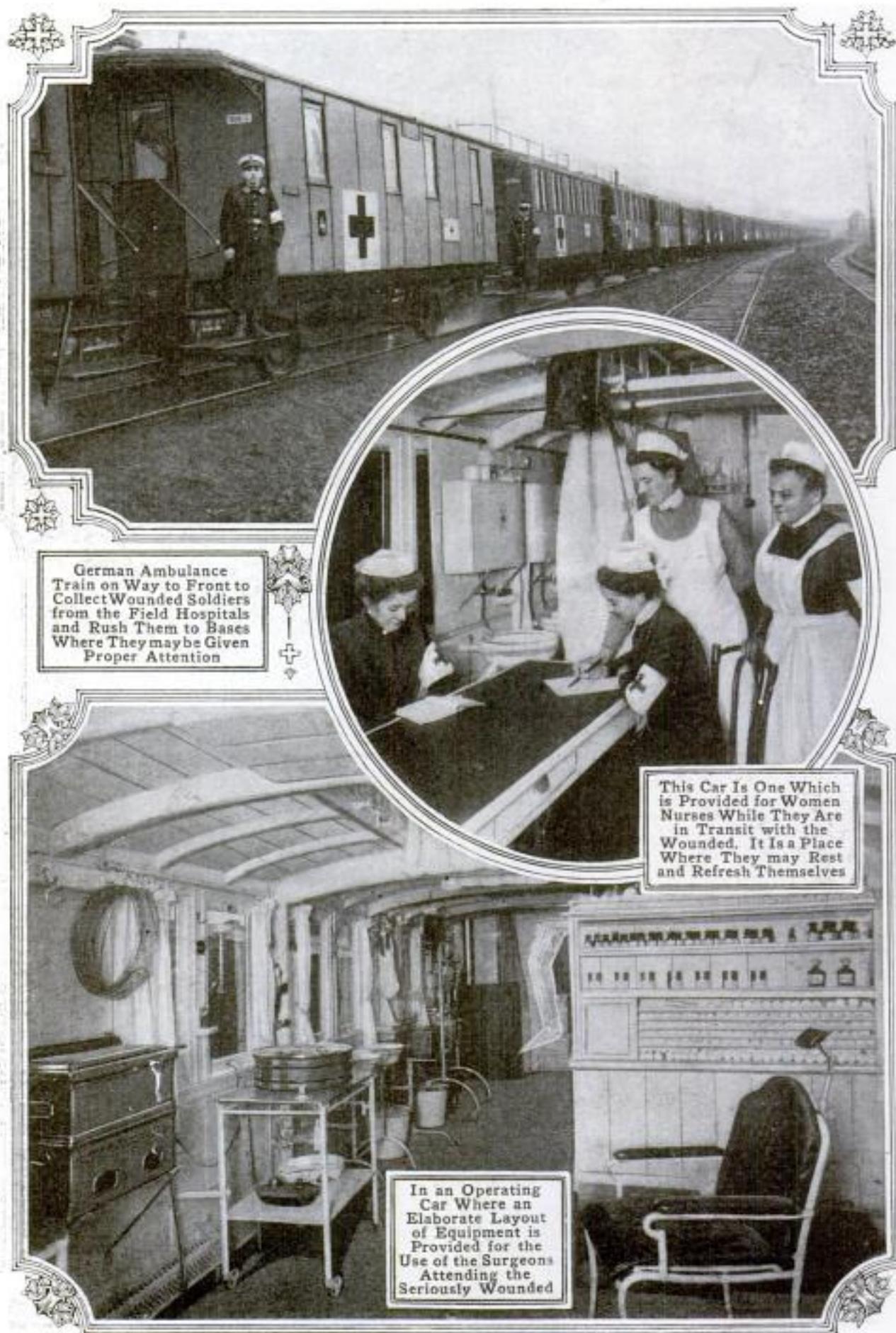
The Austrian Aeronautic Base at Przemysl before the Triumph of the Russian Forces: The Machine Shown in the Foreground was Used to Generate Gas for Captive Balloons. The Field Hangars are to be Seen in the Distance

COPYRIGHT, UNDERWOOD & UNDERWOOD

MACHINE-GUN BATTERIES ON THE FIRING LINE



GERMAN AMBULANCE TRAIN READY TO TRANSPORT



COPYRIGHT, BROWN & DAWSON

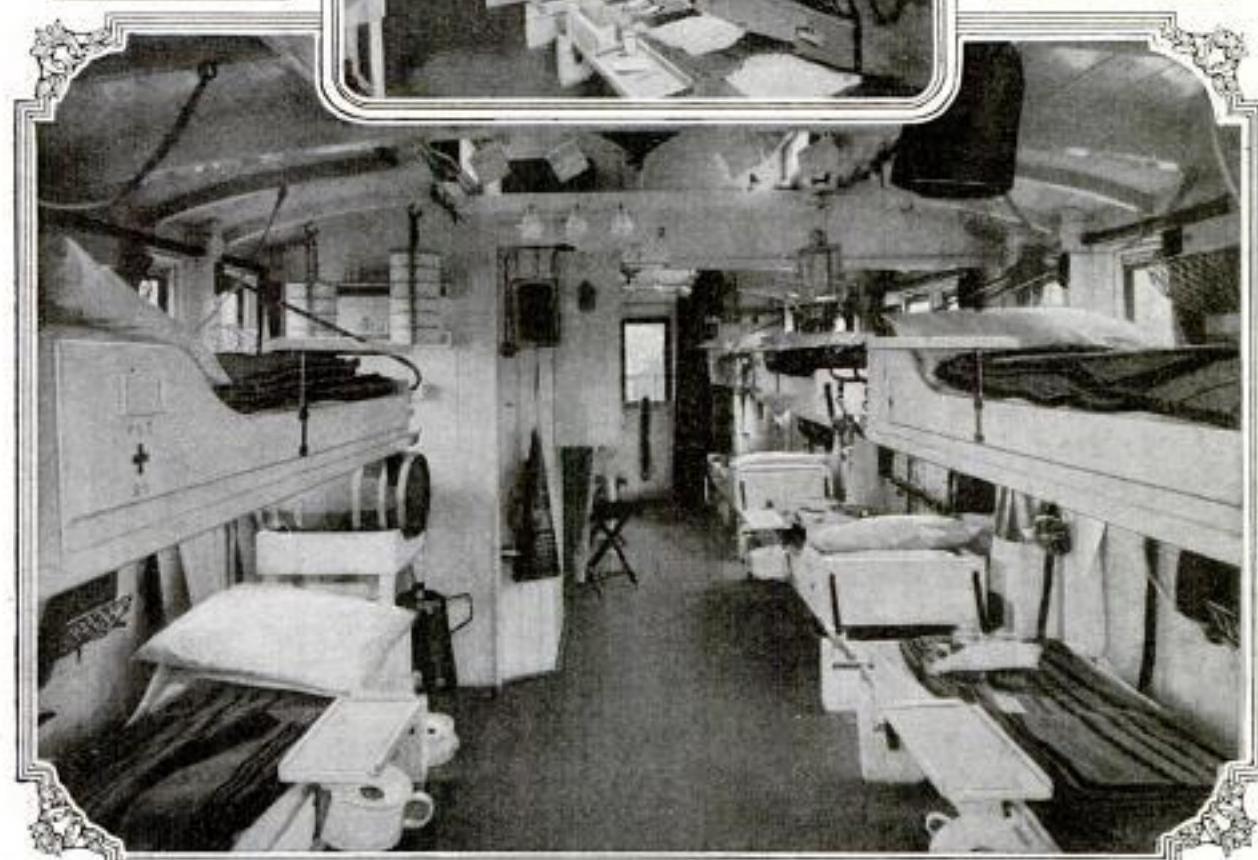
ARMY OF WOUNDED SOLDIERS TO HOSPITAL BASES



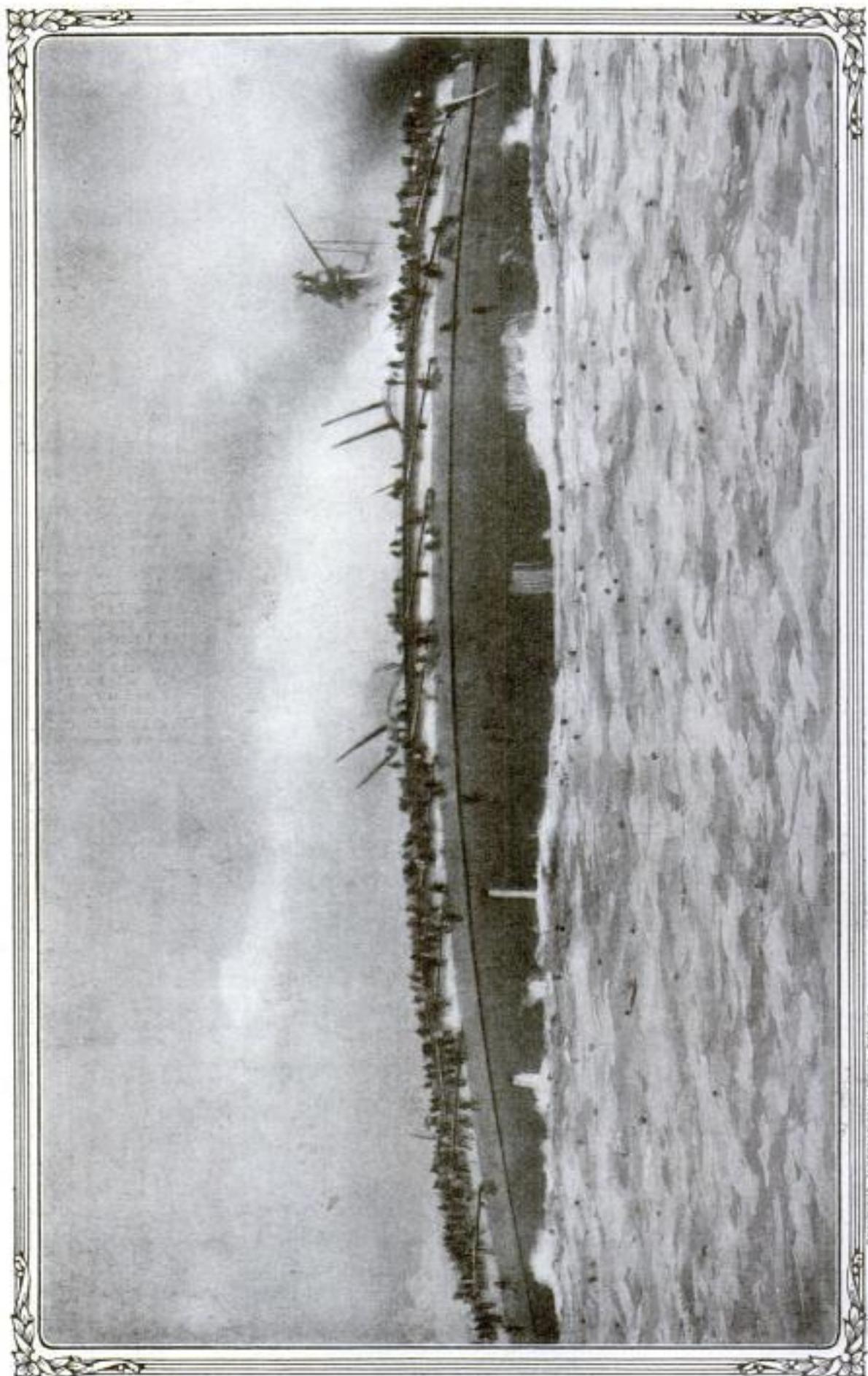
There Is Little Delay in Handling the Men When the Train Arrives at the Hospital. They are Removed on Stretchers as Quickly as Possible



At the Left and Below are Shown the Interiors of Ambulance Cars Where the Wounded are Cared for en Route between Field and Hospital



AWAITING DEATH ON THE SINKING "BLUECHER"

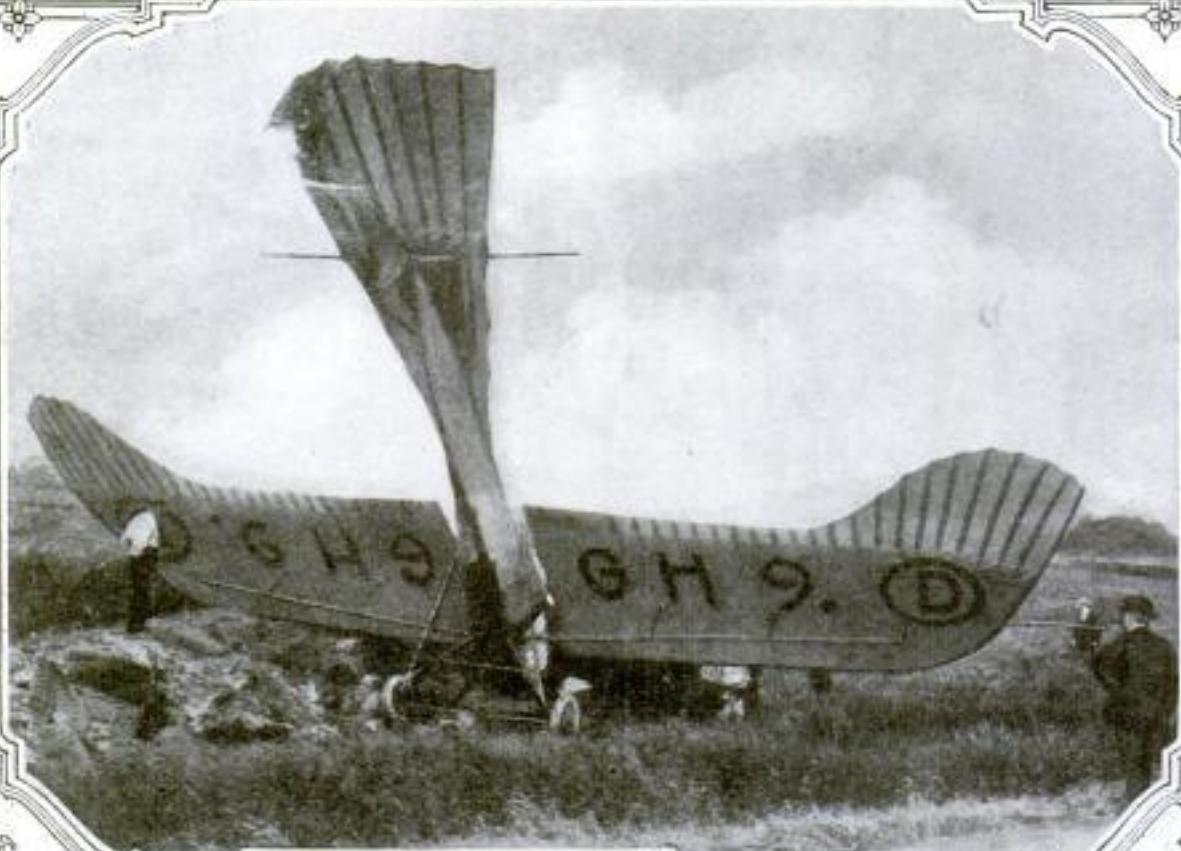


COPIED FROM THE INTERNATIONAL NEWS SERVICE
The Last Minutes of the German Cruiser "Bluecher," a Mass of Flames after being Torpedoed in an Encounter with a British Fleet in the North Sea; Scores of Its Sailors, Still Alive, but Waiting for Death, are Clinging to the Slippery Hull as the Vessel is Gradually Turning Over and Sinking from Sight

NEW ARTILLERY PIECES NOW IN USE IN EUROPE



THE WAR AEROPLANE AND ONE OF ITS ENEMIES

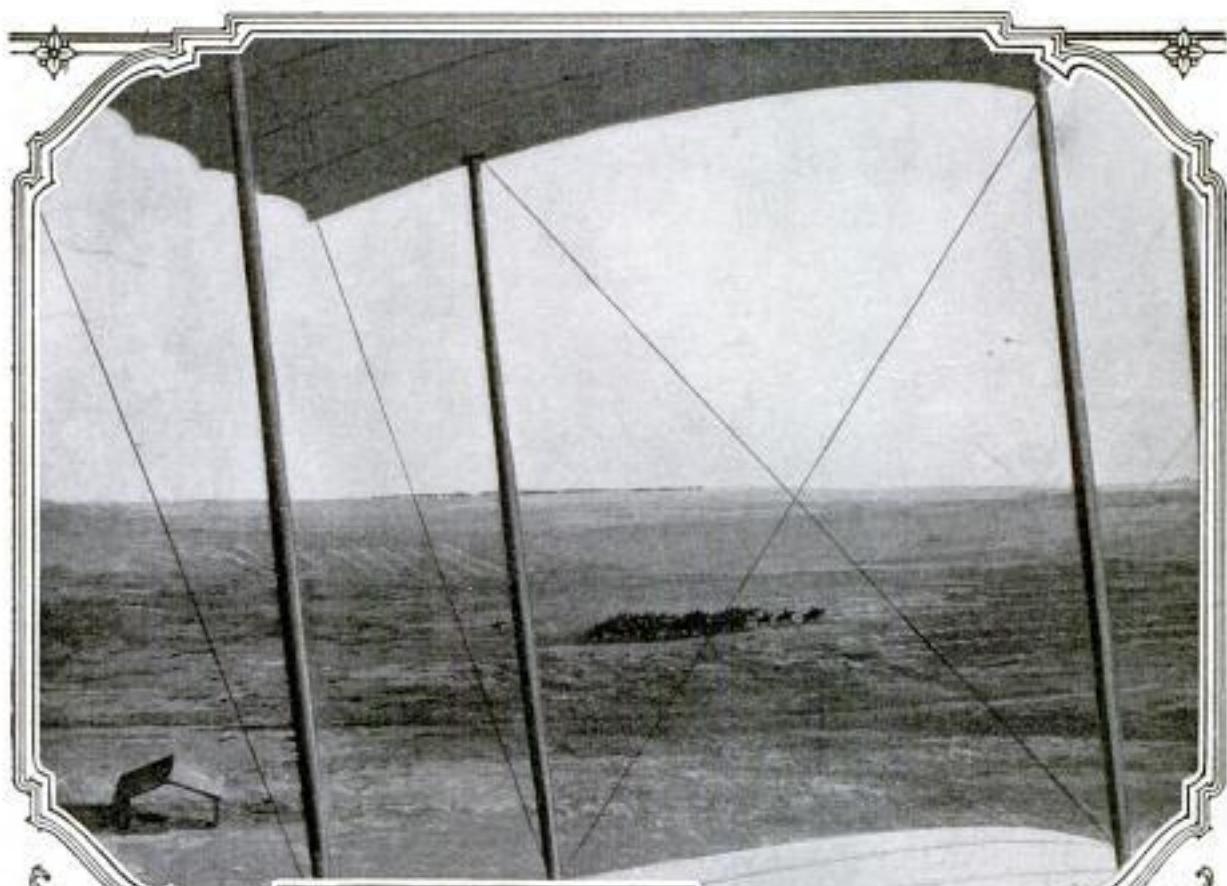


Wreck of a German Taube, One of Several Craft Sent over the French Lines on a Scouting Expedition. The Airman was Struck by a Bullet from a Machine Gun and the Aeroplane Crashed to Earth



Battery of French Armored Motor Cars, One of the Several Enemies of the War Aeroplane, Halted for Consultation of Road and Contour Maps of the District Ahead

SEEN ON DIFFERENT EUROPEAN BATTLE FIELDS

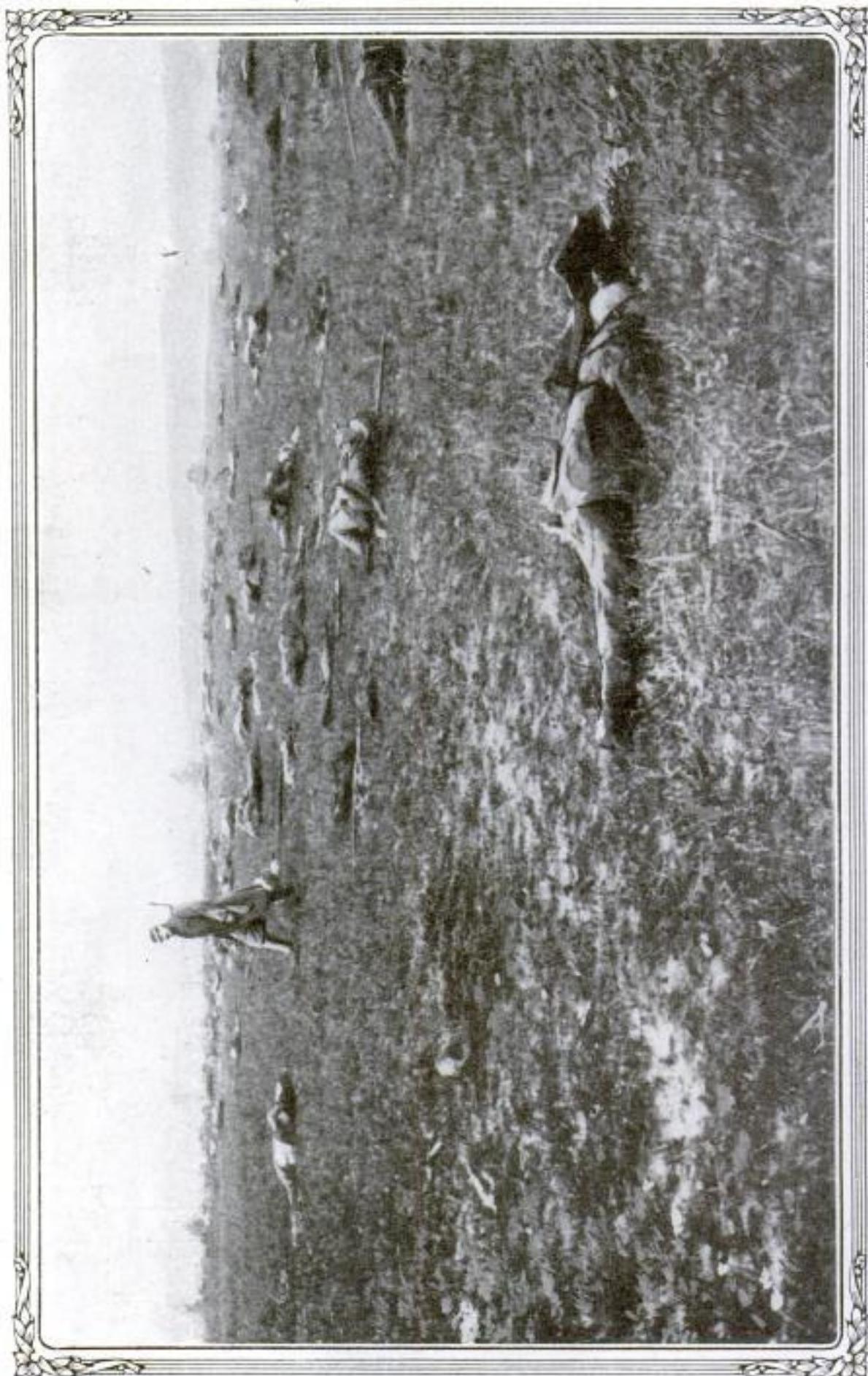


This Shows What an Aerial Scout Sees When He Flies above an Enemy's Lines for Reconnaissance Purposes. Approaching Below Is a Cavalry Squadron in Advance of Heavier Forces in the Background



An Approaching German Taube was Sighted by the Crew of This French Motor Car. A Rain of Bullets was Directed at the Speck in the Sky, but the Flier Escaped

THE "GLORY OF WAR" AS THE SOLDIER SEES IT



CORRECTIONAL UNIVERSE AND UNIVERSAL PRESS
This Photograph, One of the Most Remarkable Ever Taken on a Battle Field, was Made Following a Charge by German Forces across Open Ground in the Face of French Machine Guns. Dead Litter the Field Farther Than the Eye can Reach. The Scene Shows the "Glory of War" as the Man at the Front Sees It

UNUSUAL THINGS BEARING ON EUROPE'S WAR



Copyright Underwood & Underwood
Steel Armor
for the
Individual
Soldier on
Sale at a
French Shop:
The Bullet-
Proof Plates
are Strapped
to the Body

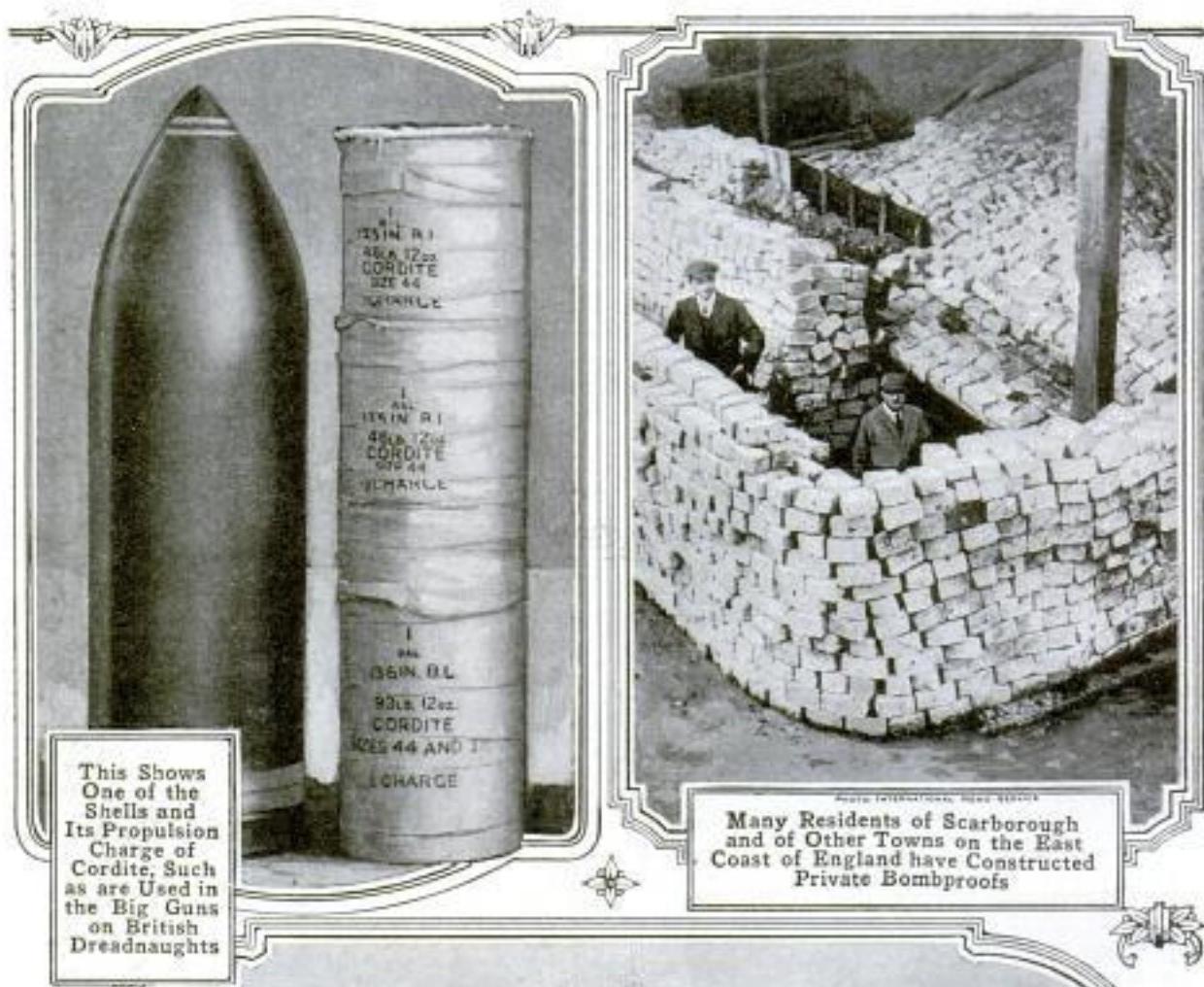


Copyright Underwood & Underwood
This Shows a Clip of Cartridges,
Carried by a British Soldier in His
Bandolier, Which was Pierced by a
Bullet during an Engagement



Copyright Underwood & Underwood
An Army Maneuver Ground near
Berlin being Plowed Preparatory to
Planting Spring Vegetables for the
Poor Classes Who Are in Need

CURIOSITIES OF THE WAR SEEN BY THE CAMERA



SCOUTS AND SNIPERS AT WORK AT THE FRONT



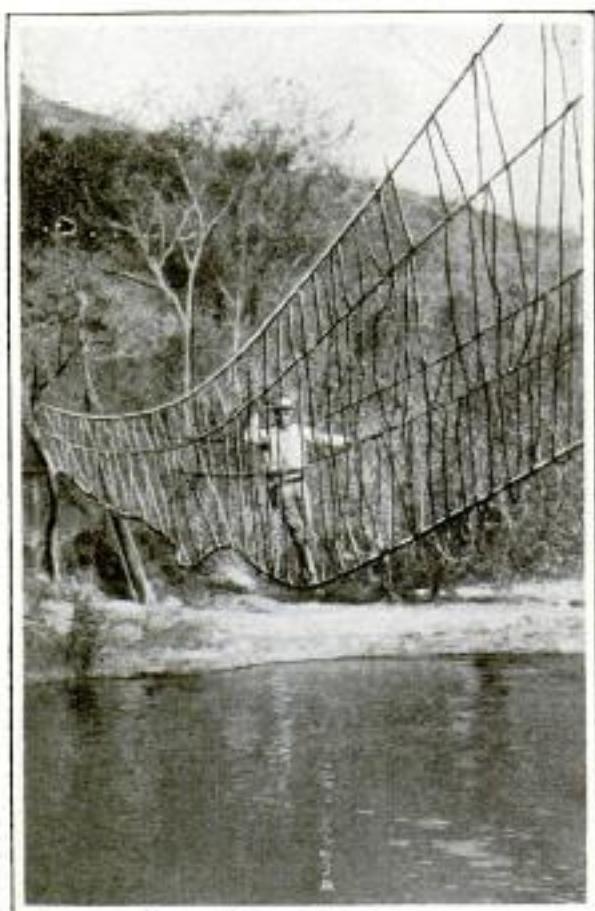
albert E. Reed, P.O. Box 571
Guayaquil, Ecuador, S.A.

700

POPULAR MECHANICS

ROPE BRIDGE OVER RIVER IN ECUADOR MOUNTAINS

Across one of the several rivers in the mountainous province of El Oro, in the western part of Ecuador, is a



This Hammock Bridge Forms the Only Means of Crossing above the Stream at This Point

hammock bridge constructed entirely of rope. At the point where this swinging structure is stretched between the bluffs on either side of the stream, it forms the only means of crossing above the water. To use it, a person is forced to hold to the guy lines on either side and walk dexterously along a single rope which forms the bottom chord of the V-shaped network. For the uninitiated this requires no little exercise of care, but the mountain people who are accustomed to it climb along the line with great agility and ease.

The development of the "jitney bus" has stimulated the market for second-hand automobiles.

Information given F.P.S. by Frederick William Wile of the London Daily Mail

NEW BRITISH HOWITZER IS CALLED "COVENTRY GUN"

Howitzers that compare with the famous 42-centimeter guns of the Germans, which were the big surprise of the beginning of the present war, have been built for the British army and some of them have already been taken to the continental war zone.

The new weapon, known in England as the "Coventry gun" from the place of its manufacture, has a bore of 15 in. as against the 16.5 in. of the big German war tool. It is claimed, however, that it will fire a heavier projectile and has a mile greater range. Its chief advantage, however, lies in its portability. The "Busy Bertha," as the German gun has been nicknamed as a compliment to Frau Bertha Krupp, the owner of the famous gun works, requires an extensive concrete foundation, and except where such emplacements have been prepared in advance, it takes two or three days to get the monster ready to be fired. The Coventry gun, on the other hand, can be completely assembled in five hours and can be placed wherever the ground is firm enough to support a traction engine.

The standard shell for the Coventry gun weighs a trifle over 1,800 lb. Its head is solid, of armor-piercing type like a naval shell. Back of this is the chamber for the lyddite, or other high explosive, constituting the bursting charge, and the rear end of the shell is another solid mass, to give momentum. The whole is so designed that the shell has great penetrating power and will not explode instantly upon impact but an appreciable instant afterward, so that if the shell should penetrate the wall of a fortress the explosion would take place inside.

The expectation of the British authorities is that these new Coventry guns will be used against the German fortified towns in Alsace and Lorraine. Twelve of them have been built. Should they all go into action at once the combined weight of metal thrown in a single broadside would be more than ten tons.



WHERE SHIPS ARE HIGH AND DRY TWICE A DAY

IN the Bay of Fundy, Canada, the daily rise and fall of the tide is as great as 60 feet in some parts of the narrow inlet that penetrates 170 miles inland from the sea. The harbor of St. John, N. B., at low tide, is shown in this photograph, the water rising every 13 hours to within a few feet of the wharf stringpiece. The hard sandy bottom is a good motor highway at low tide.

9494 USING MOTOR LAUNDRIES IN EUROPEAN WAR

Motor-drawn laundries operated in connection with field hospitals are the latest feature in the European war, the equipment for each laundry being carried on a powerful motor truck and three trailers. The motor truck carries a steam mangle which is removed when the laundry is to be operated. The first trailer carries a complete steam plant with boiler, turbine, drying cabinet, and disinfecting tank, while the second carries the washing machine with centrifugal drying drums and other accessories. Tools and such supplies as soap, soda, coal, and gasoline are carried on the last trailer. When the laundry is in operation the trailers are arranged in the shape of a horseshoe and are usually covered by a tent, while the motor truck, with the steam mangle removed, is used for carrying laundry to and from the hospital. The capacity of the outfit is about 3,000 lb. of assorted laundry per day.

MINIATURE FLYING MACHINE ORNAMENT FOR HAIR

9181 One of the odd styles that have been developed in Europe since the outbreak of the war is a new fashion in head dress which is worn in England with clothing of a military cut. The hair is built high on the head with puffs and surmounted by a miniature aeroplane, which is supported at the end of a slender wire that fastens in the coiffure. Frequently a small flag is also used as an ornament in addition to the flying machine.

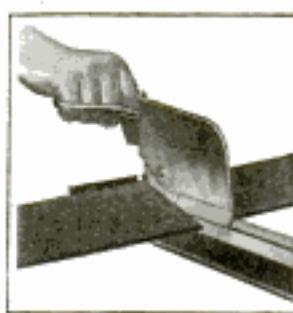


mer: West River Co., Georgia, Ills.

Inventor: J. Ellis Dodd, Sales Mgr.
G. Herschel Mfg. Co., Georgia, Ills.

BELT-CUTTING INSTRUMENT**9033 TIME-SAVING DEVICE**

Designed for the purpose of cutting various kinds of belting and squaring the ends without requiring the use of



a try-square, an instrument has been devised which may be used on any size belt not greater than 14 in. in width nor more than 1 in. thick. The device consists of a heavy drawknife, the top part of which is fitted with a handle while the bottom part extends through a groove into an inclosed case where it is mounted on roller bearings. The case is made of steel in the form of a grooved bar, at one end of which, on either side of the groove, are two upright pieces

which protrude above the surface sufficiently far to hold a belt squarely when it is being cut. The groove serves as a guide for the knife and the top of the bar as a cutting table.

WIRELESS BETWEEN UNITED**STATES AND NORWAY**

Daily News

Through the operation of wireless stations now being erected in Massachusetts and on the coast of Norway, commercial wireless communication between the United States and Norway is soon to be established. The two American stations, one located on Cape Cod and the other at Marion, on the west shore of Buzzard's Bay, are now practically completed. The total cost of these two stations is estimated at about \$1,500,000. It is now reported that the stations are to be put in operation as soon as completed to meet the situation arising from the war.

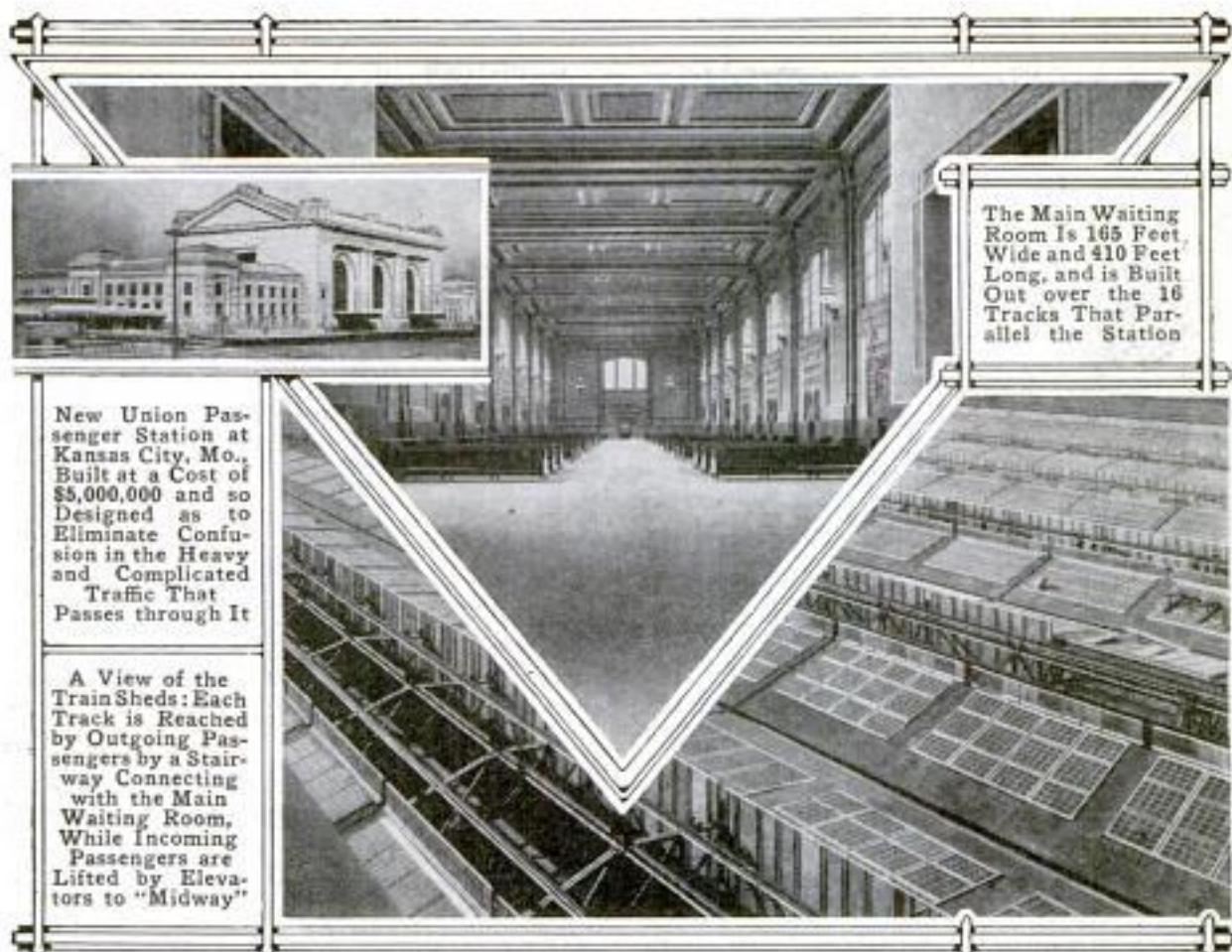
MODERN STATION PLANNED TO ELIMINATE CONFUSION

8896 Facilities for handling complicated passenger traffic on a large scale, without confusion between the different routes or between incoming and outgoing traffic, probably constitute the biggest feature about the new union passenger station at Kansas City, although the station itself is one of the largest and most costly in the world. An average of 260 trains daily, carrying a total of from 25,000 to 28,000 passengers, use this station, and every day there are about 530 tons of mail and 7,000 pieces of baggage handled. The value of the tickets sold annually is something like \$5,000,000.

The most impressive feature about the station is the grand lobby, a spacious room entirely free from columns, 230 ft. long, 100 ft. wide, and 90 ft. high. The ticket office, built of solid bronze and having 24 windows, occupies the space between the two main entrances and projects 48 ft. into this room. Around the walls are grouped dining and lunch rooms, and all other

facilities needed by the traveler. The grand lobby is the only place in the station where incoming and outgoing passengers meet. Outgoing passengers go from this room into the main waiting room, which is a structure 165 ft. wide and 410 ft. long, built out over the 16 tracks that parallel the station. From this room individual stairways lead down to each of the track platforms. Incoming passengers are lifted by elevators to one of the two "midways," which are simply corridors leading to the grand lobby. The midways are located one on each side of the waiting room, are parallel with it and at approximately the same level. The baggage room is the largest in the United States, containing over 74,000 sq. ft. of floor space. All baggage, mail, and express is transferred to and from trains through tunnels passing under the tracks. The station cost about \$5,000,000, while the terminal of which it is a part cost upward of \$50,000,000.

Kansas City News Service, 200 Corn Belt Bldg. K. City, Mo.
J. H. Morgan, 1002 Main St., Kansas City, Mo. Copyrighted material

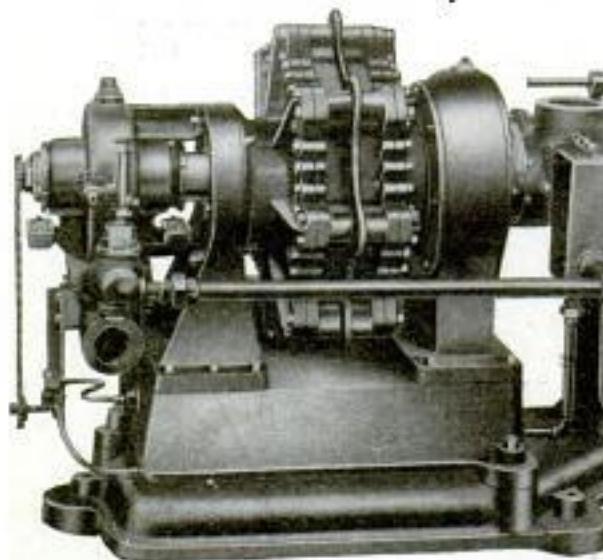


MacGrath Faulder
341 W. Onondaga St.,
Syracuse, N.Y.
704

POPULAR MECHANICS

FREIGHT CARS ARE BUCKLED 9/4/08 IN HEAD-ON COLLISION

While running at considerable speed on one of the eastern railways recent-



ly, a long freight crashed head-on into a heavy work train. The impact of the collision was so great that two of the box cars were buckled by the solid resistance ahead and the momentum behind them. Such behavior is not



Two Cars in the Middle of a Long Freight Train Buckled When a Head-On Collision Occurred

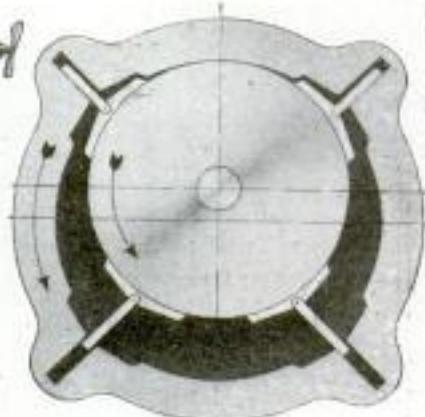
unusual for two engines when coming together, but for cars in the middle of a train is not so common.

ROTARY AIR COMPRESSOR 8383 OF A NEW TYPE

A simple and ingenious rotary air compressor that has just been developed, compresses the air by utilizing the alternate expansion and contraction of pockets formed between a ro-

*Wernicke-Hatcher Pump Co.,
Grand Rapids, Mich.*

tating casing and a cylinder that rotates within it, both the casing and the cylinder being made to rotate in the same direction and at the same speed but on offset centers. Owing to the eccen-



The Alternate Expansion and Contraction of the Pockets Causes Air to be Drawn In and Then Compressed in Each Pocket

tric mounting, the casing and cylinder are close together at the top, while the space between them spreads down each side and has its greatest width at the bottom. This space is divided into four pockets by vanes that are hinged to the cylinder and project into slots in the wall of the casing. The shaft of the cylinder is hollow and is mounted within the stationary bearing of the casing. By means of pipes projecting into each pocket air is drawn in through one end of the hollow shaft and discharged through the other end. As a given pocket rotates away from the top it widens at a regular rate, sucking in air until it reaches the bottom. During this process only the inlet pipe is open. When the pocket starts up the other side the inlet pipe closes automatically, and the air is compressed as the space contracts. When the pocket reaches the top, the outlet pipe opens, and the compressed air is discharged into a container through the hollow shaft. Leakage from one pocket to another is prevented in a simple manner. In the case of adjacent pockets that are compressing, the pressure is greatest in the one that is in the lead, and the excess pressure thrusts the vane against the side of the slot, forming an air-tight seal.

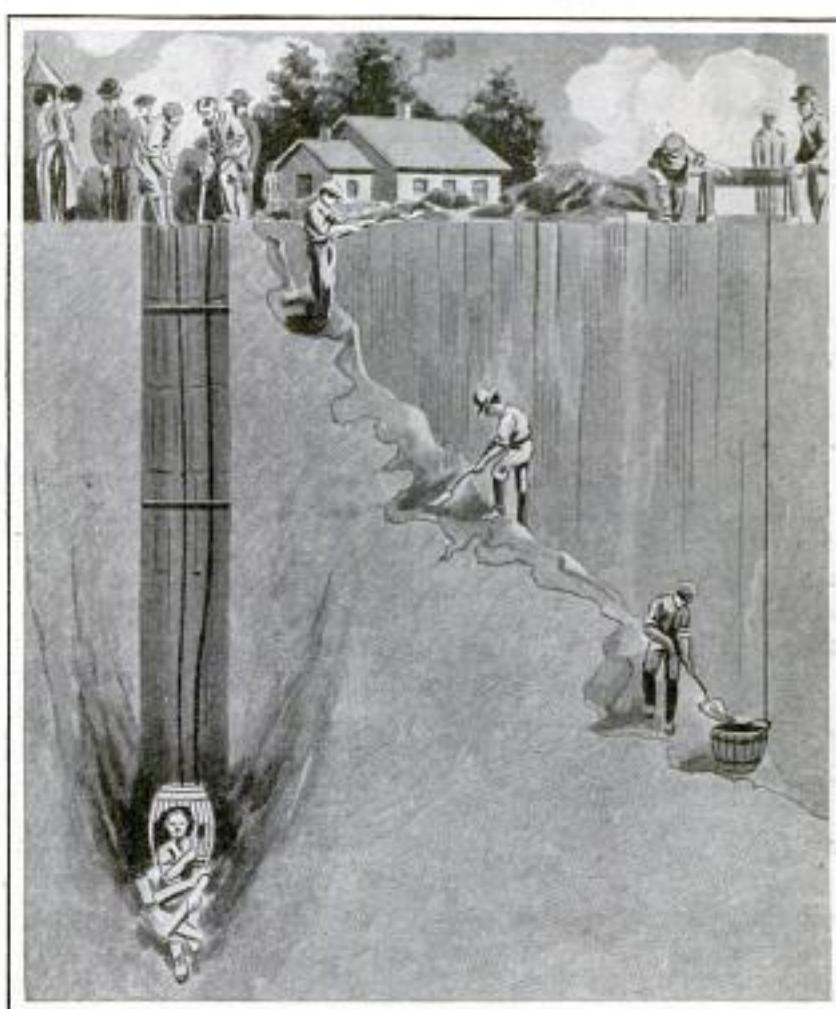
NEW SERVICE TO BROADEN 9313 PATROL OF COASTS

With the creation of the United States Coast Guard a system of coast patrol is to be put into effect which will practically constitute a beginning in the plan of girdling our coasts with a series of wireless stations operated in conjunction with a submarine patrol, as suggested in the January, 1915, number of this magazine. The life-saving service, which has been absorbed by the coast guard, maintains a beach patrol that keeps a lookout for ships in distress and has a system of telephone lines connecting with the life-saving stations. Under the new arrangement this system will be perfected and the life-saving stations will be connected, either by wireless or by telephone, with naval stations along and near the coast. This system is designed to be used in connection with life-saving and revenue-cutter services, but its value in time of war is evident, as the coast patrol would then have a means of giving to the Navy Department immediate notice of the approach of hostile vessels.

MAN BURIED IN QUICKSAND 9381 KEPT ALIVE UNTIL SAVED

In the course of digging a well shaft on his property near Ware, Mass., a farmer encountered quicksand at a depth of approximately 25 ft. beneath the surface of the ground, and sank in it until his head alone was visible when

his predicament was finally discovered. Every possible agency was called upon to assist in the rescue work, the fire department included, but despite this he was buried for more than 24 hours before he could be taken from his pre-



With a Barrel over His Head and Getting Both Air and Nourishment through Tubes, a Man Lived, Buried in Quicksand, Until Rescuers Reached Him after More Than 24 Hours

carious position. The reason for this was that in digging the shaft he had stood on a platform made of planking and when the quicksand sank beneath his weight his feet were caught by the boards, making it necessary to uncover his entire body before he could be saved. This work, at first sight an easy task, was rendered difficult by the continual caving in of the shaft when the rescuers, clinging to a ladder, attempted to dig the man out. This plan had to be abandoned entirely, and to keep the victim alive it was necessary to make an improvised helmet out of

Boston Herald, Boston Globe,
and Chicago Tribune

E. Hallen, Balboa Heights
C. Z.

a barrel and lower it over his head. Reaching from this were two rubber tubes, one of which was used to supply him with air and the other to provide him with nourishment. From a point about 50 ft. away from the well a ditch 30 ft. deep, which was timbered as the work went on, was dug to the shaft and the man finally reached.

BIRTHDAY-CAKE CANDLES 8822 HELD ON BOARD

Birthday-cake boards arranged to accommodate any number of candles up to 96, are being made of hard wood



Board for Birthday Cake Holds Large Number of Candles

finished in its natural color. These boards are circular in shape, and around the outer margin is provided a series of holes in which the candles are held, while the cake itself is placed in the middle of the tray. When the board is used the practice of placing candles on the cake is not followed.

Mr. W. Boosworth,
Watertown, N.Y.
Mrs. Avis Gordon Westel
4243 N. Kostner Ave., Chicago, Ills.

SAILING CRAFT ARE USING 9418 PANAMA CANAL

Contrary to the general belief of navigators prior to the opening of the Panama Canal, sailing ships are using the new passage as well as steamers. The expense of tolls and towing, it was assumed, would make it less desirable for such craft, usually carrying cheap bulk freight, to cross the isthmus than to make the longer voyage around the Horn. Experience thus far, however, indicates the contrary.

The largest sailing vessel that has so far used the canal is the four-masted steel barkentine "John Ena," a photograph of which, taken while it was passing through the Culebra Cut at the narrowest point of the canal, is shown on the opposite page. The "John Ena" is 313 ft. long, 48 ft. beam, and 25 ft. deep, and measures 2,609 net tons by canal measurements. The cost of passing through the canal was \$3,130.80 for toll and \$302.15 for tug service. On the vessel's cargo of 4,400 tons of petroleum and wax this makes a charge of 78 cents a ton. The tolls on laden steam vessels have averaged around 75 cents a ton of cargo. These do not require tugs through the canal.

According to the estimates of the canal authorities a sailing vessel should reach the isthmus from New York in about 20 days, or from the English Channel in about 30 days. Besides the "John Ena," four other sailing craft had used the canal up to the middle of February. The largest vessel of any kind to pass through the canal in that time was the passenger steamship "Kroonland" of the Red Star Line, flying the American flag, which went through on February 2. The "Kroonland" is 560 ft. long, 60 ft. beam, and drew over 29 ft. of water when traversing the canal. The canal-toll charge for the passage was \$9,879.60.

A Pan-American gold coin of the value of \$5, for use as standard currency in all the countries of North and South America, is proposed by a New York bank.



The Four-Masted Steel
Barkentine "John Ena"
Passing through the Culebra
Cut in the Panama Canal. The
Photograph was Made as the
Vessel Was Opposite the Famous
Cucaracha Slide, the Narrowest
Point in the Canal

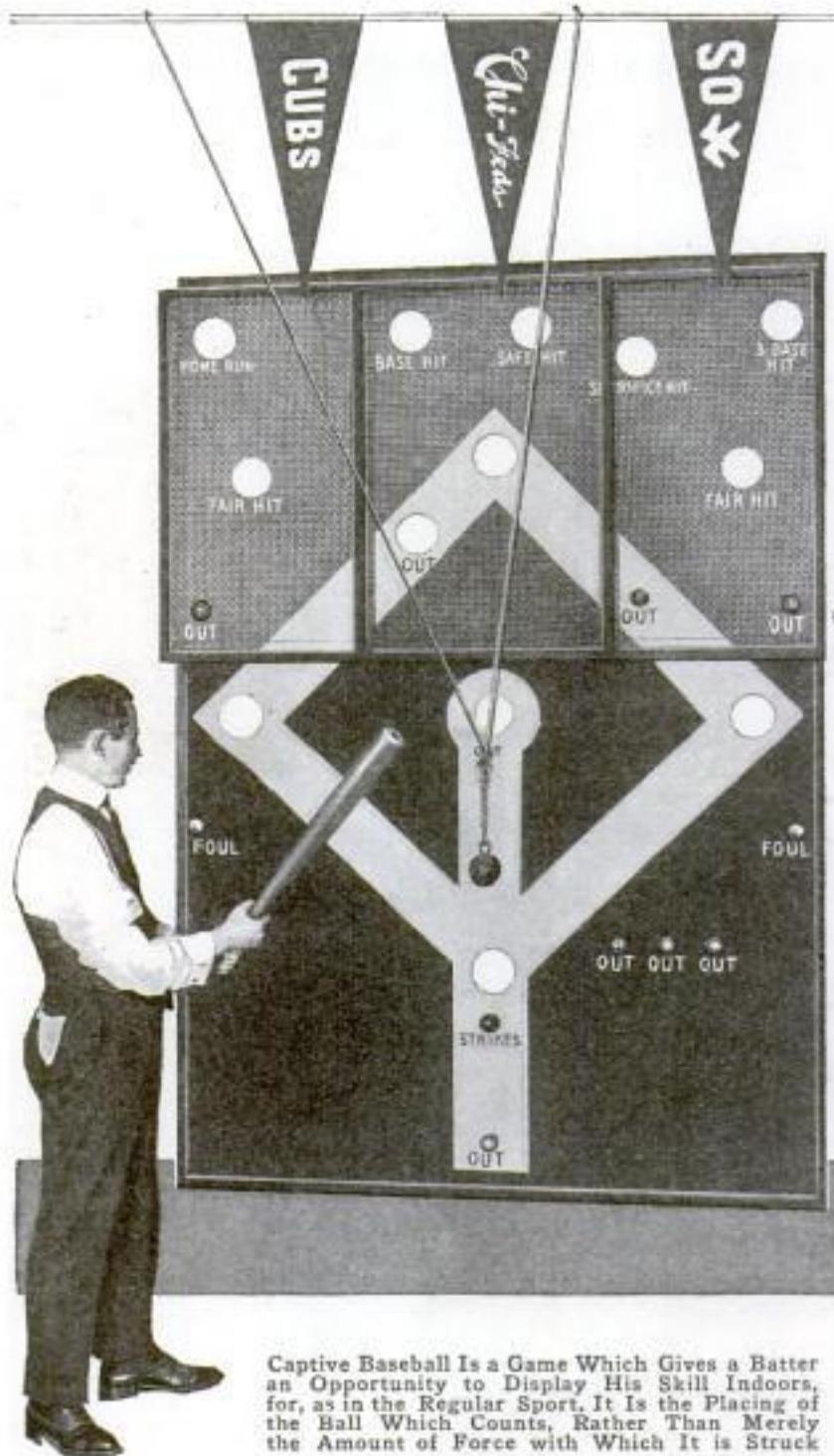
#Leather L. Sargent, 933 1st St.,
Wash. D.C.

Inventor: Edna Gay Ramsey,

708 Penn Yan, POPULAR MECHANICS

CAPTIVE-BASEBALL GAME 9368 PLAYED INDOORS

Captive baseball is a newly devised indoor sport. It is played with an ap-



Captive Baseball Is a Game Which Gives a Batter an Opportunity to Display His Skill Indoors, for, as in the Regular Sport, It Is the Placing of the Ball Which Counts, Rather Than Merely the Amount of Force with Which It is Struck

paratus which is partly electrical, but in principle very like some of the devices used in amusement parks. The chief difference in this game is that the

pitching machine is absent. The ball is suspended at the end of a cord hung in front of the batter, who stands before a backstop on which a diamond and the various positions taken by the different players are marked plainly. Placement of the ball is the point of the game. A pull on the line holding the ball starts it swinging, the batter then knocking it against the backstop, or registering board, and his score being shown by the ignition of one of a number of incandescent lamps.

SILENT AREA OF FOGHORN NOW EXPLAINED

Fog signals, under some conditions, may be audible for a distance of a mile or more from the signal station and again at a distance of three or more miles, while between these areas lies a space within which the signal cannot be heard. Many wrecks that have occurred while near-by fog signals were in full blast are attributed to the fact that the wrecked vessel was in this belt of silence, steaming toward the rocks, and its officers could not hear the foghorn until too late to alter the ship's course or check its momentum. Observations conducted by British authorities, in which

the temperatures of fog banks at different heights above sea level were recorded by instruments sent up on kites, indicate that the existence of the silent

The Engineer 2-5-15

Paper written by Edwin O. Gafford, Engineer in Charge of Design Engineering Department, Standard Oil Co. of New Jersey.

Geo. A. Walton, 3 Lennys Court
Newbury, Mass.

POPULAR MECHANICS *Avalon* 709

area is due to temperature variations. The atmospheric temperature was found to rise with the altitude in every fog examined. In some instances, however, a layer of air in which the temperature rose more slowly overlay the fog bank. Such an air layer would refract the rising sound waves more slowly, and these refracted waves would return toward sea level at a much wider angle than those refracted through the lower mass of fog. In such a case, the foghorn would be audible close by and at a distance, but not in the intermediate region.

ASH TRAY WITH CONTINUOUS MATCH-STRIKING SURFACE *9156*

A new device for the convenience of smokers is designed to do away with the annoyance of trying to get a safety match to light when the striking surface on the box has become moist or worn out. This device consists of a tapelike roll several yards in length, provided with a striking surface, and placed in a circular container so that it can be drawn out as required. It is being applied to match holders, ash trays, and smokers' sets generally. When the exposed surface has been worn out all that is necessary is to pull the roll out to expose a fresh surface



How the Continuous Roll for Striking Safety Matches is Inserted in a Match Holder

and tear off the used part. The end of the roll is held in place by a metal clip. The roll is easily replaced when worn out.

*Mr. Deaderick Co.,
405 Lexington Ave.,
N.Y. City.*

WATCHES DESIGNED FOR USE ON AERIAL VOYAGES *7660*

Before the outbreak of the European war, when Lieut. John Cyril Porte, of the British navy, was pre-



Aeronautic Watches Carried in Cases Which Strap about the Body of a Pilot

paring for his contemplated transatlantic air voyage in the flying boat "America," which was recently shipped to England for service on the continent, two watches intended to be used in making longitude calculations were constructed especially for him. The instruments are designed to furnish both astronomical and sidereal time, and are carried in a pair of leather cases which may be strapped about the body below the chest. The pockets of these are so made that, should water penetrate into them, it would be discharged immediately through small ducts in the bottom, so that the watches would not be injured or stopped.

Casein, the substance in milk which forms the basis of cheese, is now being used also as the base for so-called "cold cream" for toilet purposes.

Paul Thompson
10 Spruce St.
N.Y.C.

710

POPULAR MECHANICS
Army and Navy Journal
HOW AN ARMY "FIRES ON
8786 THE CLOCK"

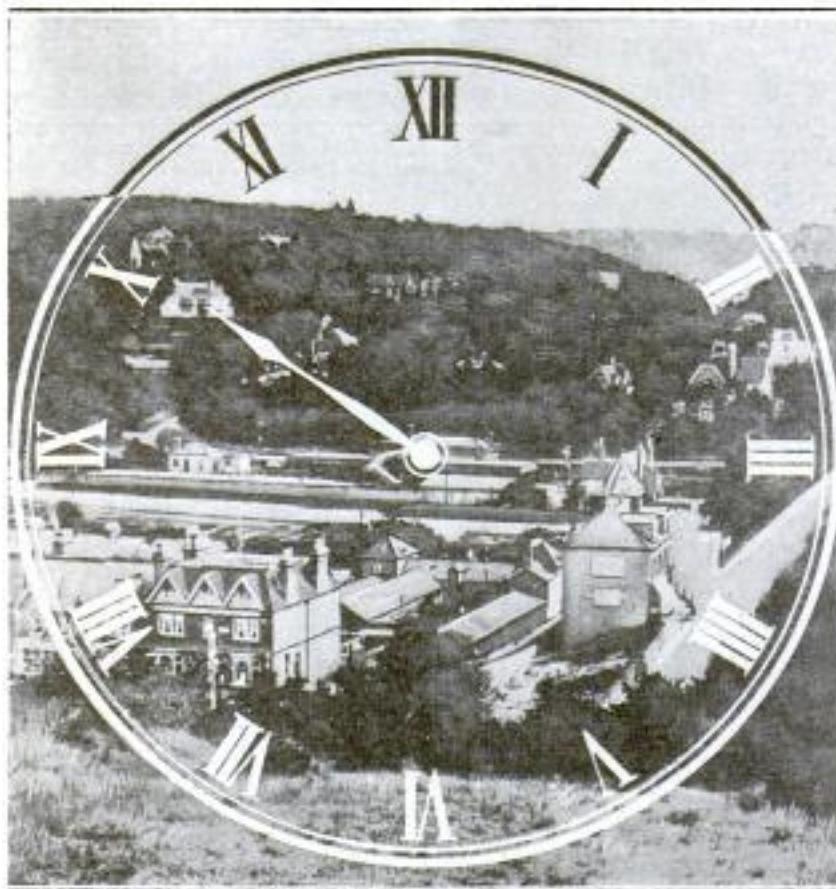
LARGEST MODERN GUN OWNED
BY ITALIAN GOVERNMENT

An ingenious method, known as "firing on the clock," is much used in the European war for enabling a military officer to concentrate the fire of his command on any particular point. This method consists simply in designating the object to be fired at by its position with reference to an imaginary clockface covering the landscape. The point that forms the center of this imaginary clock must first be understood all around, and a line passing upward and back from this point is, of course, the 12-o'clock line. Then when a command comes down the line to direct the fire at "white house, 10 o'clock," for example, or at "road, 9 o'clock," the rifleman or artilleryman knows definitely which particular white house or road is meant, and is able to direct his fire with the assurance that he is obeying orders.

In view of the accounts of destruction wrought by the remarkable 16.5-in. siege guns of the German artillery, it is interesting to note that the largest modern naval gun has a bore of 17 in. and is owned by Italy. The instrument weighs 104 tons and hurls a projectile of 2,000 lb. Great Britain has a gun which, although slightly less in caliber, exceeds this piece in both muzzle velocity and power of penetration. When a missile leaves this gun it is traveling at a rate greater than 1,380 miles an hour, which enables it to pierce 3 ft. of wrought iron with ease.

SCORE BOARD FOR THE
8766 PANAMA CANAL

A wall board, 12 ft. long and 3 ft. high, on which is painted a map of the Panama Canal and its approaches, has been mounted in the port captain's office at each end of the canal, and push pins, each representing a ship, will be used in connection with this map for showing at a glance the status of traffic at any time. As soon as a vessel enters either end of the canal a report is telephoned to each port captain's office. A pin representing the vessel is then placed on the map, and as the vessel passes the different locks and Culebra Cut the pin is moved to the corresponding positions. The maximum speed at which vessels are allowed to pass through the canal varies from 6.9 miles an hour, in Culebra Cut and Miraflores Lake, to $17\frac{1}{4}$ miles an hour over a part of Gatun Lake.



An Imaginary Clock Covering the Landscape Enables a Military Officer to Concentrate the Fire of His Command Quickly and Accurately on Any Desired Point

The Canal Record



This Large Tree was Uprooted during a Storm and Hurled against the House, Partly Wrecking It

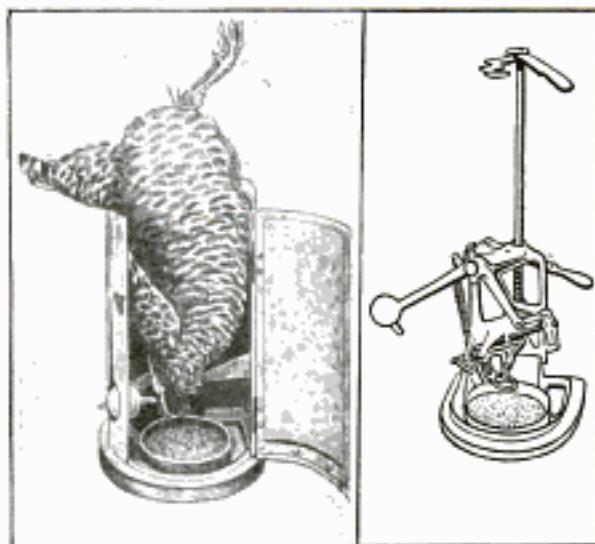
TREE HURLED UPON HOUSE 9363 IN VIOLENT STORM

During the course of a heavy storm at Stockton, Cal., a large eucalyptus tree was uprooted and thrown violently against one side of a two-story frame residence. The weight of the tree and its impact crushed in the roof of the house and wrecked one of the bed chambers so completely that had the accident occurred at night when the room was in use, its occupants undoubtedly would have been killed. The tree was more than a half century old, approximately 10 ft. in circumference, and a landmark of the town.

MACHINE FOR KILLING 9042 CHICKENS

A machine recently invented enables the operator to kill chickens, or other poultry, while they are concealed from view. In using this machine the fowl is placed, head down, in the casing which contains the mechanism, and the side door is closed. The legs of the

fowl are held in a clamping device while the head is gripped by a ringlike device and a V-shaped collar. The mechanism is worked by a lever projecting from the casing. This lever operates a lance within the casing which penetrates the brain of the fowl, causing instant death, and also releases a pendulum device which strikes off the head.



With This Machine the Chicken is Killed While Concealed from View

Inventor: Vernon Cassard, Stamford, Conn.

Lester L. Sargent, 933 I St., Wash., D. C.

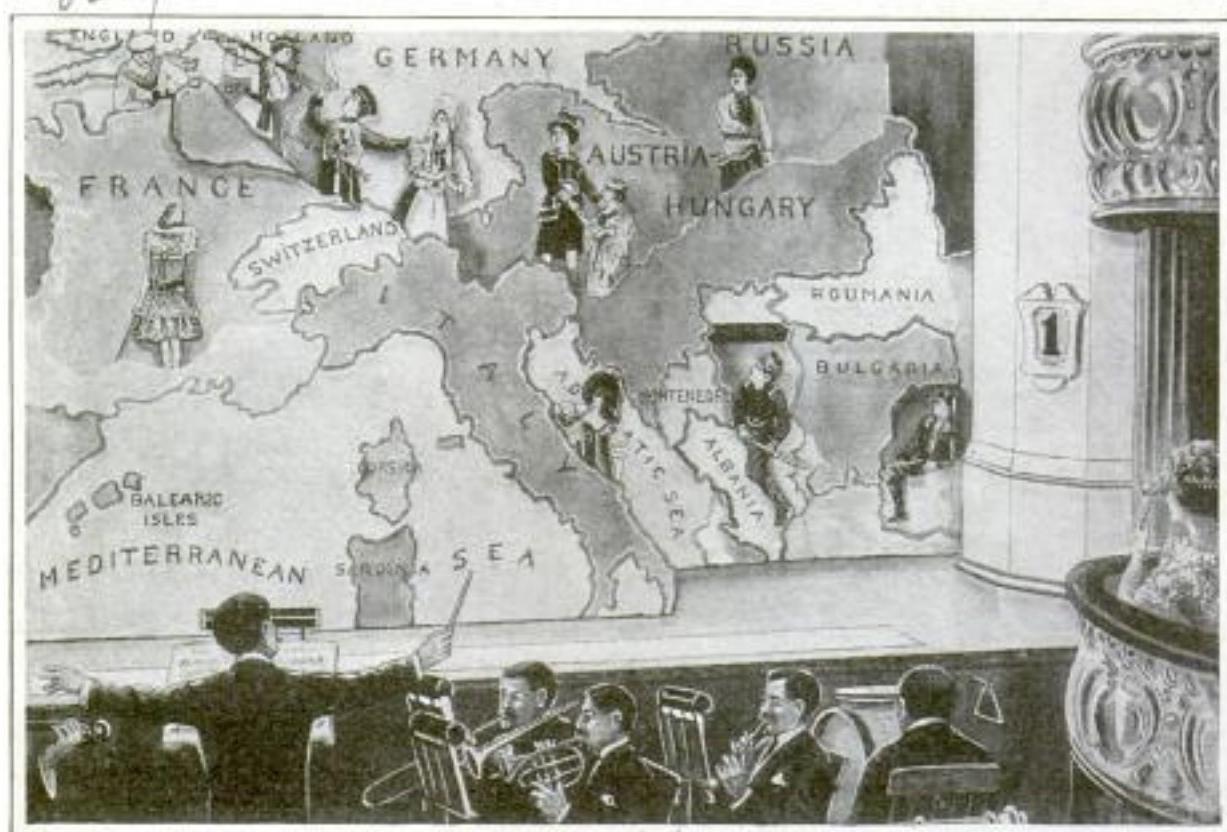
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The Sketch

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8329

POPULAR MECHANICS

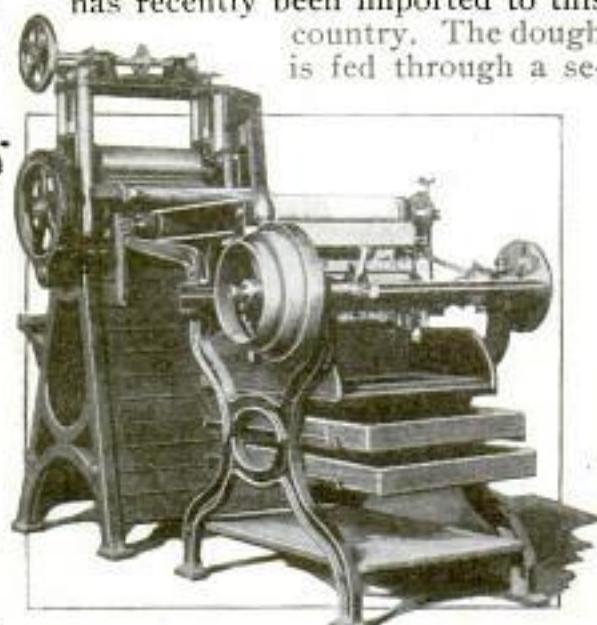


LONDON THEATER TAKES LIGHTER VIEW OF WAR

IN this novel war show, staged in a London theater, singers dressed in the costumes of the countries represented appear at openings in the map, which forms the background of the stage, and sing songs typical of the different countries.

MACHINE MAKES NOODLES 7807 IN MANY SHAPES

Fifty-two different shapes of noodles may be made on one machine which has recently been imported to this country. The dough is fed through a se-



Noodle Machine Having Fifty-Two Different Sets of Dies

*W. D. Goodwin, 527 W.
124th St. N.Y.C.*

ries of rollers, the pressure of which is regulated according to the thickness it is desired to make the pastry. A broad sheet of the dough is pressed out and run beneath dies which cut out whatever shape is desired, after which operation the noodles are dropped into trays which are placed in racks beneath the knives.

LINCOLN HIGHWAY BUILDING 9063 GOES ON RAPIDLY

Considerable progress was made during the last year in carrying ahead the work of building the Lincoln Highway, which when completed will reach from New York to San Francisco. The association which is furthering the project marked 2,500 of the 3,400 miles of road, and it is announced that the route is now in such a condition that it would be possible to make a transcontinental trip over it by motor car in less than a month's time. Forty thou-

Engineering News 11-29-14

sand dollars' worth of cement was furnished by the promoting organization to different communities for use in road work, approximately three-fourths of the section passing through Ohio was paved, \$350,000 in bonds for improvements, not previously anticipated, was issued by various communities in Indiana, while in Illinois, Nebraska, Colorado, and Wyoming much improvement work was accomplished.

**ADJUSTABLE HEADPIECE ON
COUCH HAMMOCK**

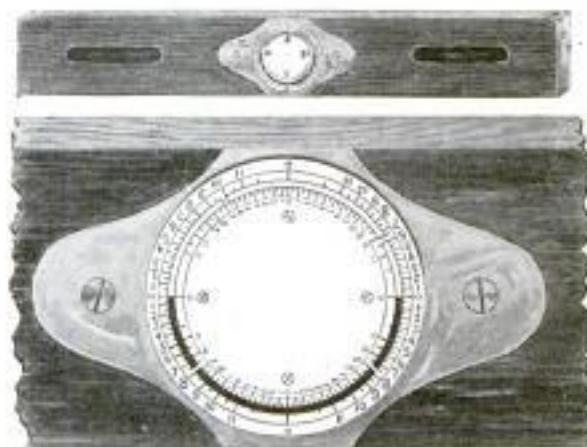
Intended to be used in a sun parlor or on an open porch, a couch hammock is being made with a headrest which may be adjusted to three different reclining positions. The frame is made of steel and at the head end is provided with a brace, held by a bar and ratchet, which supports the mattress when it is held in a raised position. When it is desired to lift the mattress so that it is in a comfortable position for an afternoon siesta, or braced upright to suit a sitting position, it is only necessary to lift it and allow the bar to engage the proper notch. The hammock is supplied with comfortable springs, while its back and ends are made of a heavy duck. It may be suspended from hooks screwed into the ceiling, or from a collapsible stand which is provided for it.



New York Couch Bed Co.,
1418 W. 20th St.,
N.Y. City.

**NEW LEVEL TELLS GRADES
9518 IN TERMS OF INCHES**

For the use of carpenters and various mechanics, a new level has been invented which indicates, in terms of



The Number of Inches to the Foot That a Surface Is Out of Plumb or Level is Indicated by This Instrument

inches or fractions thereof, to the foot, the deviation of a surface from either the horizontal or perpendicular. The instrument is provided with a pan half filled with red spirits and fitted with a

glass face, over which a dial carrying delicate graduations is fixed. This dial is composed of two scales, one within the other, the outer of which refers to horizontal calculations and the inner to the perpendicular. The graduations and their accompanying figures are etched in glass and traced with blue enamel, which, on account of the contrast with the red liquid, allows the dial to be easily read. The spirits can only be seen in a circular rim extending between the two scales. Since the liquid is necessarily always level it enables a carpenter to determine the pitch of a rafter, a porch-floor beam, or any other structural member, while it is also equally serviceable to a mechanic or mason.

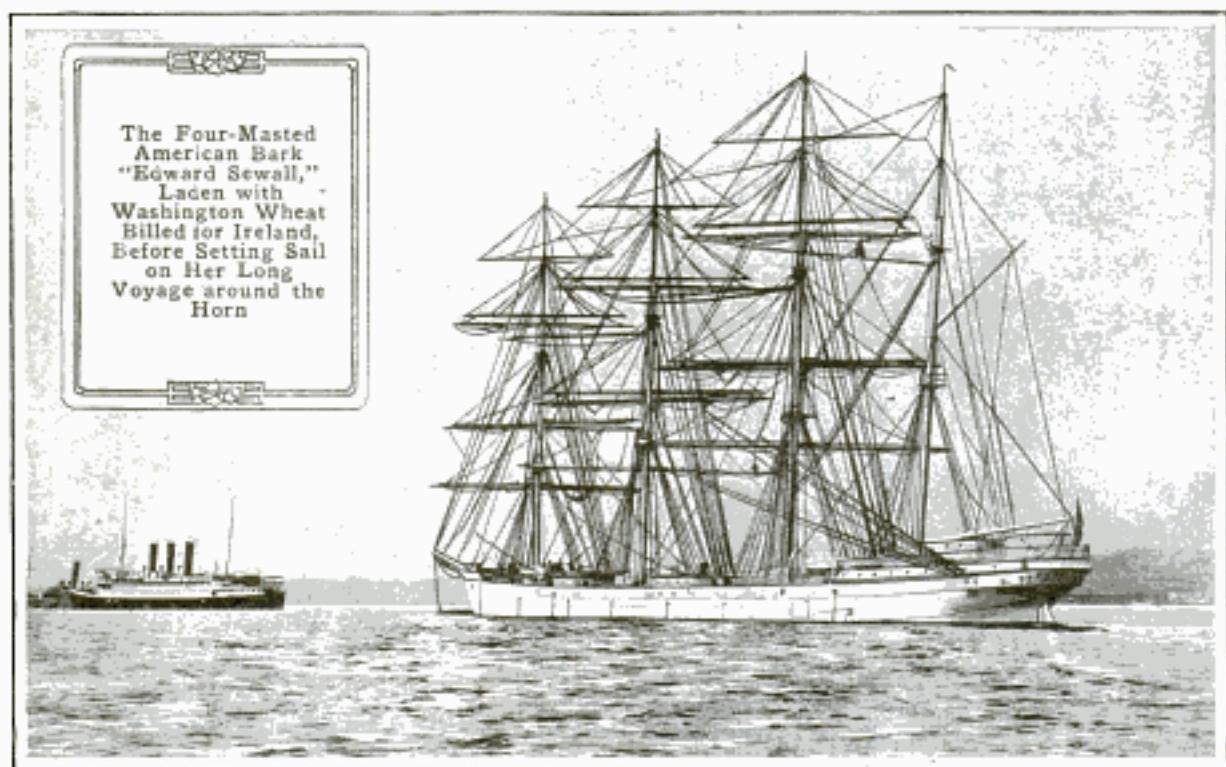
WHEAT SHIPPED TO DUBLIN IN AMERICAN BARK

For the second time in a period of 12 years an American ship has departed from Puget Sound with a cargo of grain billed for an English port. Almost equally as interesting is the fact that this particular craft is a sailing vessel. A few weeks ago a trim, four-masted, square-rigged ship, the "Edward Sew-

all," slipped out into the Pacific laden with 183,475 bu. of wheat bound for Dublin, and commenced the long voyage to Ireland by way of the Straits of Magellan. While it was only a few years ago that practically all of the Pacific-coast grain shipments were consigned in sailing craft, today nearly all of the work is done by tramp steamers of foreign registry. European conditions, however, render it safer to ship in American bottoms than in others at the present.

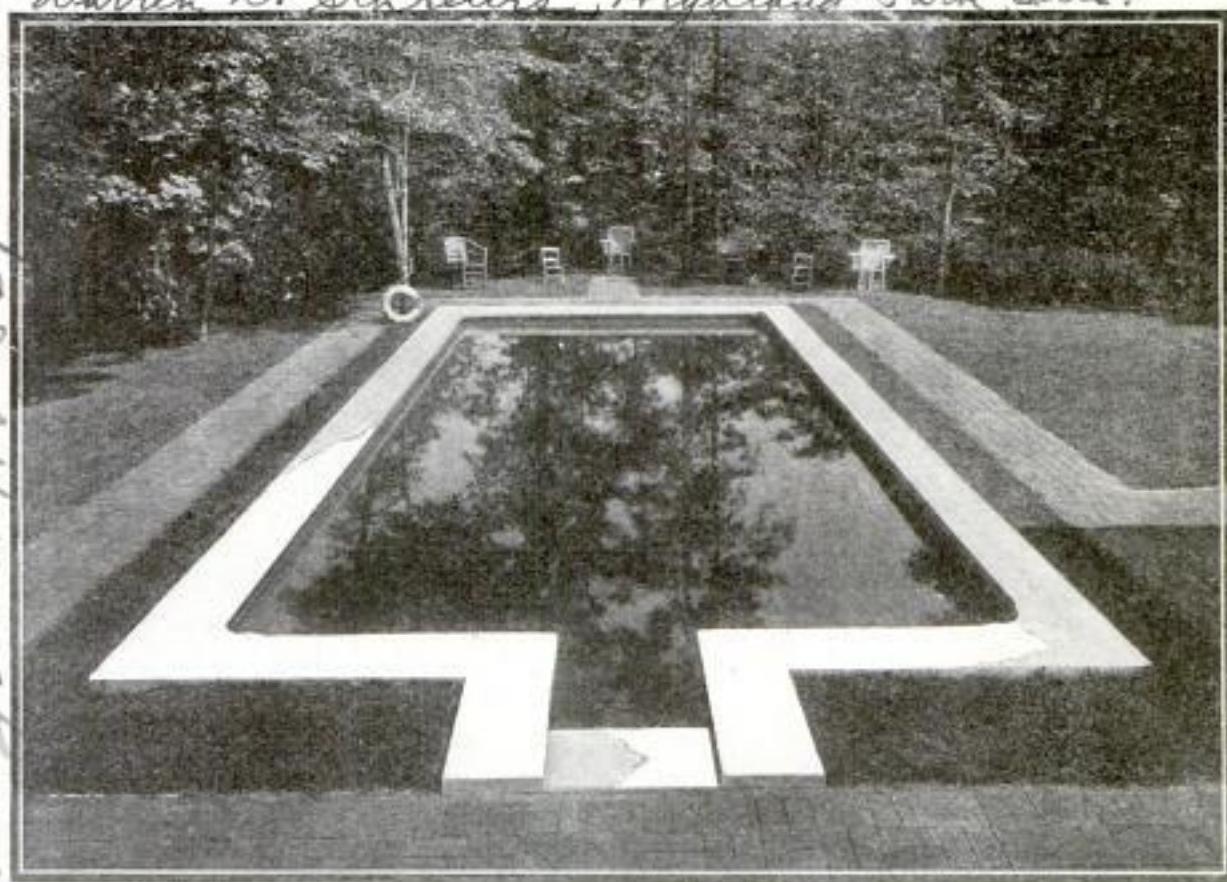
CONCRETE SWIMMING POOL ON A COUNTRY ESTATE

A modern substitute for the "old swimming hole" is the concrete swimming pool, which is now considered a necessary feature of a well-equipped country estate. The pool is usually located in a wooded part of the estate, as is the one shown in the illustration, and is made attractive in every way. This pool is 14 ft. wide and 30 ft. long, and will easily accommodate 15 bathers at one time. At one end are steps leading down into the shallow end of the pool, the bottom of the pool sloping from a depth of 3 ft. at one end to 8 ft.



*The Merchants Exchange
Seattle Wash.*

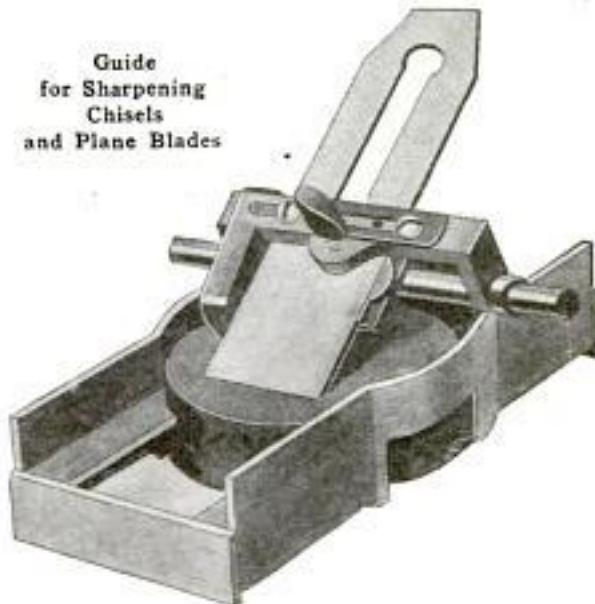
Warren D. Schreurs, Highland Park Ills.



On Well-Equipped Country Estates a Modern Concrete Swimming Pool Takes the Place of the "Old Swimming Hole"

at the other. The concrete walls rest on footings that are 9 ft. across, taper to 14 in. at the top and are capped with copings, while the floor ranges in thickness from 1 ft. at the deep end to 6 in. at the steps. A life preserver is always at hand, while seats are provided for the spectators when a swimming party is given.

to cut through. The new guide is designed with a metal holder for the sharpening stone, and an adjustable angular mounting for the blade, or bit,



Guide
for Sharpening
Chisels
and Plane Blades

TOOL-SHARPENING DEVICE FOR WOODWORKERS

For the use of carpenters, and other woodworkers, an instrument has been devised which makes it possible when sharpening a tool, such as a chisel or plane blade, to hold its cutting edge firmly against the surface of a sharpening stone at any angle desired while moving it with a rotary motion. To do this by hand without the aid of a guide is a difficult operation which frequently results in the rounding of an edge, giving the bit later a tendency to "ride" on the surface it is supposed

enabling an angle to be maintained throughout the whole sharpening process.

*mfr: Luther Grinder Mfg. Co.,
285 S. Water St., POINT ST.
Milwaukee, Wis.*

Underwood & Underwood, 417 Fifth Ave., N.Y. City.

Article and three pictures by Chas. W. Person, 206 W. 105th St,
CONCEALED BATTERIES OF ELECTRIC PROJECTORS N.Y.C.

9166



Above is Shown a Cluster of Projectors Hidden in the Ornamentations on a Side of One of the Tourelles, While at the Right Is the Woolworth Building as It Now Appears at Night When Its Tower is Illuminated



PHOTO COPYRIGHT UNDERWOOD & UNDERWOOD

ILLUMINATE TOWER OF WOOLWORTH BUILDING

Along the Edge
Roof Is a
Electric

of This Penthouse
Battery of
Lights

9166

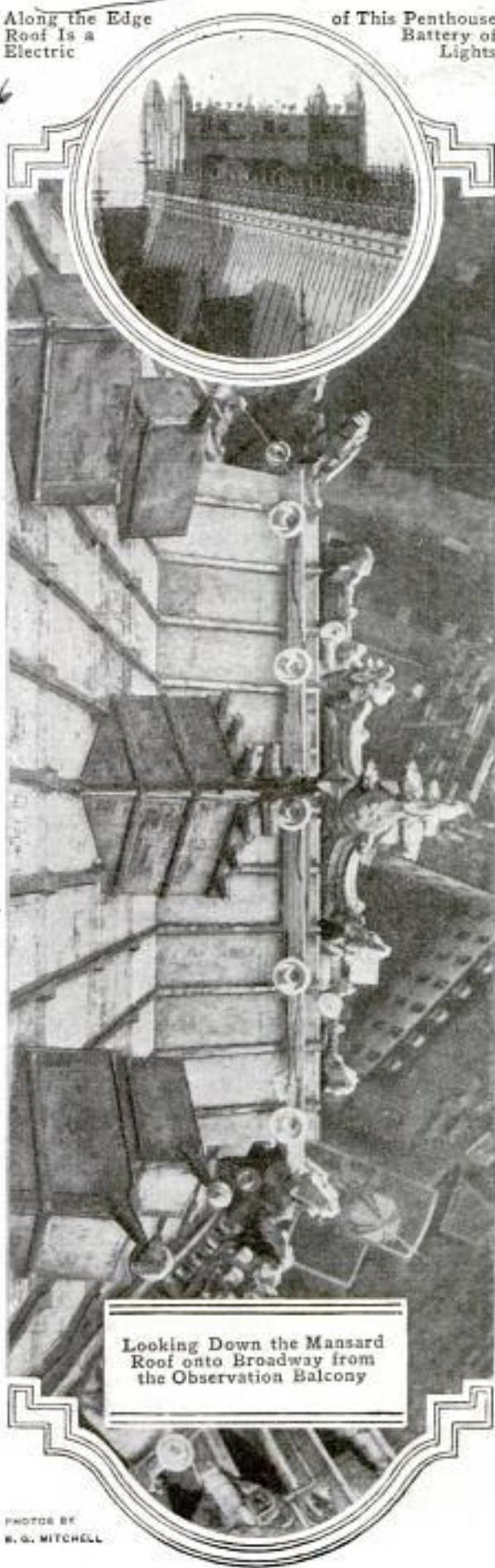


PHOTO BY
E. G. MITCHELL

BY a remarkable arrangement of reflectors, screens, and powerful batteries of lights, the tower of the Woolworth building, the highest inclosed structure in the world, now pierces New York City's skyline at night as a great white shaft reaching nearly 800 ft. above Broadway.

In order to make the building stand out in the darkness with the same majesty as it does during the daytime, the tower has been fitted with an elaborate system of hidden lights which illuminate almost every inch of its masonry. The work which has been accomplished represents an unusual example of illuminating-engineering skill, for in bathing every nook and crevice with light, the sources of this light have been hidden from view.

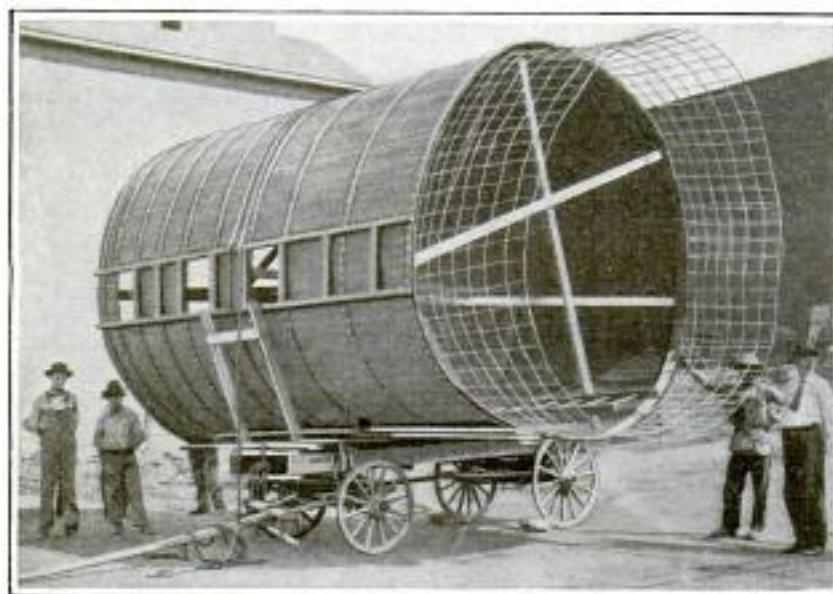
Approximately 600 projectors, each supplied with a 250-watt incandescent lamp, have been placed in various positions on the shaft so as to play their light over its surface. To illuminate the west side of the structure a battery of projectors has been arranged on the north and south sides of the penthouses at the thirtieth story and directed upward at different angles so as to throw the glare as far as the forty-third floor. To light the north and south sides of the tower a similar scheme has been carried out on the gabled roofs at the same floor, while to cover the east side the projectors are placed on a narrow balcony opposite the twenty-seventh story.

At the forty-third floor a set of lamps is placed so that the light is directed downward to cover the spots not illuminated by the lower batteries, while a complicated system of screening is employed to shield them so that they cannot be seen from the street. From the same floor and also from the forty-ninth, other lamps are focused upward to reach the fifty-third story, at which point the mansard roof begins. On the four tourelles opposite this floor there is a series of projectors that play the light upon the observation balcony at the fifty-eighth floor and cover the intervening space.

**PORTABLE SILOS ARE USED
BY MISSOURI FARMERS**

Portable silos are being used by a number of farmers in an agricultural

moved to any part of a farm without difficulty or a material consumption of time. By thus being able to carry the silo into a field, the cost of hauling fodder to it is reduced as well as a considerable amount of time saved. The structure is built with fir flooring held together with wooden hoops, while the inside is reinforced to prevent its collapsing when being transported on a wagon. There is also a certain economical value in the fact that the silo may be moved from one point to another year after year, resulting in a better distribution of fertilizing material than would be true if stock were fed in one place continually. It has



One of the Portable Silos Loaded on a Wagon Ready to be Hauled into a Field

community in Missouri where experience is said to have taught their value. They are so constructed that they may be placed on a wagon and

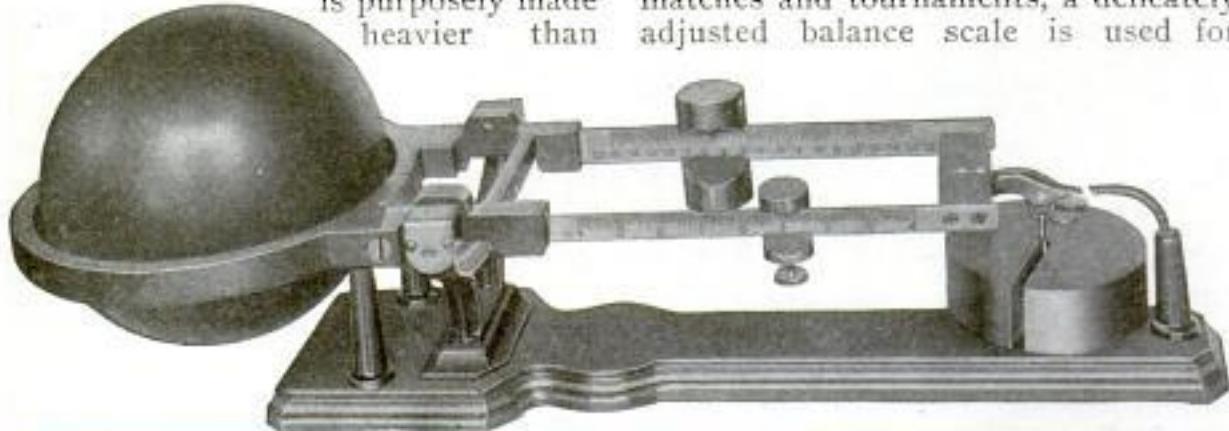
been found that the cost of constructing a silo of this kind amounts to approximately one dollar for each ton of capacity.

WEIGHTED BOWLING BALLS DETECTED BY SCALE

9375

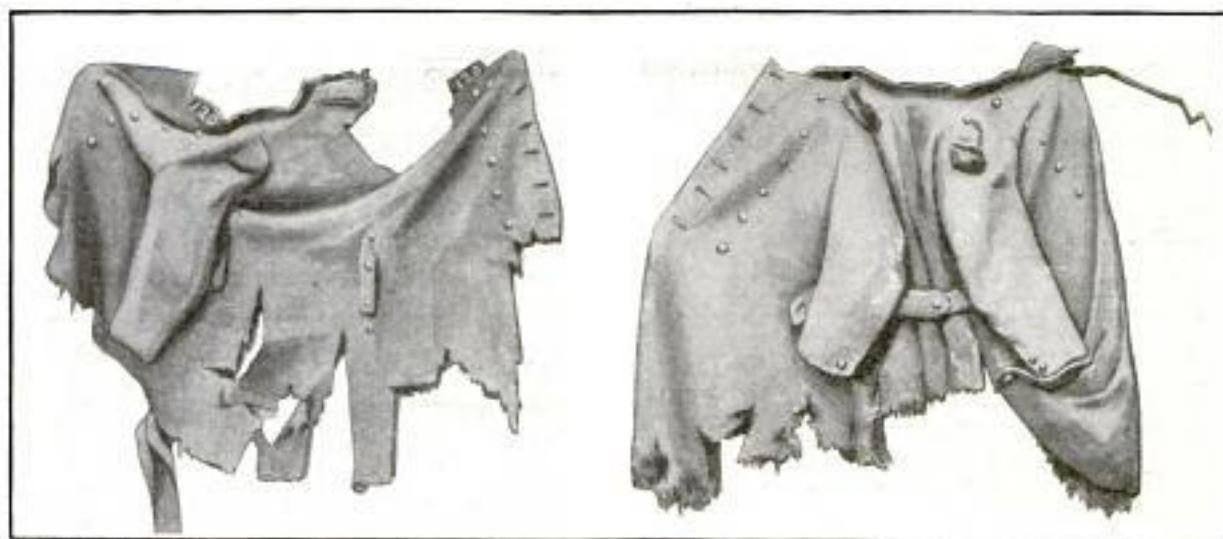
Rules of the American Bowling Congress prescribe that the balls used in a game of tenpins shall not be loaded, exceed 16 lb. in weight, nor be manufactured in such a way that one side is purposely made heavier than

another, a variance of three ounces not caused by tampering, however, being allowed. In order to determine certainly whether this specification is adhered to by the contestants in official matches and tournaments, a delicately adjusted balance scale is used for



Weighing the Various Sides of a Bowling Ball to Discover Whether It is Loaded.

Oscar A. Doob, Times Star, Cincinnati, Ohio.
maker: August Troener, Phila., Pa.



COURTESY L'ILLUSTRATION

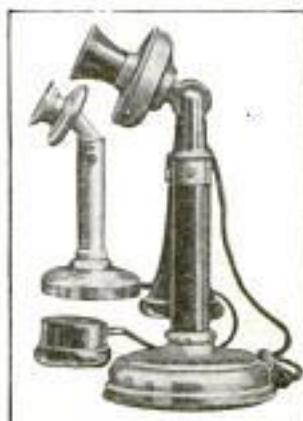
At the Left Is a Coat Torn by a Bursting Shell, and at the Right, One Cut in Two by the Flying Slugs of a Hand Grenade. In Neither Instance was the Wearer Killed.

weighing the spheres. One end of this is made with a circular rim in which the ball to be examined is placed. Extending from this are two parallel bars, graduated in fractions of ounces, at the end of which is a balancing weight. By setting the two intermediate weights at zero, a ball weighing exactly 16 lb. will balance the scale. By then turning the ball to different positions and adjusting the weights on the bars, it is possible to readily compute the difference in the weight of opposite sides, as, for instance, the variance in the weight of the front and back, or top and bottom. This makes it impossible for a ball loaded with shot or lead on one side, yet conforming with the rules regarding total weight, to escape detection.

which are battle-torn to a degree that places their history almost in a category by itself. They were cut to shreds, one by the flying fragments of a bursting shell and the other by the slugs of a hand grenade. And the remarkable part of the story is that although the coats were torn beyond repair, the wearers were not. Both men lived through their experience.

SMALL TELEPHONE FOR DESK OPERATES EFFICIENTLY

What is possibly the smallest desk-telephone instrument in use has been made by a South Dakota man. It is shown in the accompanying photograph at the side of a standard instrument, which serves to illustrate its diminutive size. Although only 6½ in. in height and fitted with a transmitter diaphragm 1¾ in. in diameter, it is used for both local and long-distance work with results which are as satisfactory as those attained with ordinary apparatus. The only essential difference in its construction



9240 TORN COATS OF SOLDIERS TELL REMARKABLE STORY

Every modern war has had its many striking examples of soldiers who were saved from probable death by a prayer book, a uniform button, a watch, a coin, or some other article which broke the force of a bullet and prevented it from penetrating a vital part of the body. The present war has also offered almost unlimited examples of these curious escapes from mortal wounds. In the accompanying photograph are shown coats of two French uniforms,

L' Illustration

C. C. Terhune
Dakota Central Telephone
Platte, S.D.
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Army and Navy Journal

MONITORS OPERATING ALONG
THE BELGIAN COAST

One of the unexpected developments of the war is the effective work that has been and is being done by modern monitors, not in coast defense, the class of work for which they were designed, but in offensive operations against a foe entrenched along the sea-coast. At the outbreak of the war three monitors, the "Javary," "Madeira," and "Solimões," had just been built in England for the Brazilian government for service on the Amazon River. These vessels were taken over by the British admiralty and placed in service along the Belgian coast. They have since played what is probably the most important part in preventing the advance of the Germans down the coast to Calais and particularly in preventing the establishment of a German naval base at Zeebrugge.

These vessels have little resemblance to the original "Monitor," with its revolving turret, built in 1862 to fight the Confederate ironclad "Merrimac." The superstructure is like that of a gunboat, but each of the vessels has the low freeboard and deck of large area that characterize the monitor type and make in effect simply a steady, floating gun platform. Each monitor is heavily armored, has a displacement of about 1,250 tons and a draft of only 4½ ft. The armament consists of two 6-in. howitzers throwing a 100-lb. projectile at a muzzle velocity of 3,000 ft. per second, two howitzers throwing a 35-lb. projectile at a muzzle velocity of 1,150 ft. per second, four 3-pounders firing 30 rounds per minute, and six machine guns of rifle caliber. With this armament 1½ tons of metal can be discharged every minute. Each vessel has a speed of a little more than 13 miles an hour and can easily carry enough coal for a voyage from England to New York.

The shallow draft of the monitors makes them particularly efficient for work along the Belgian coast, as they can operate in shallow waters and are practically immune against torpedo

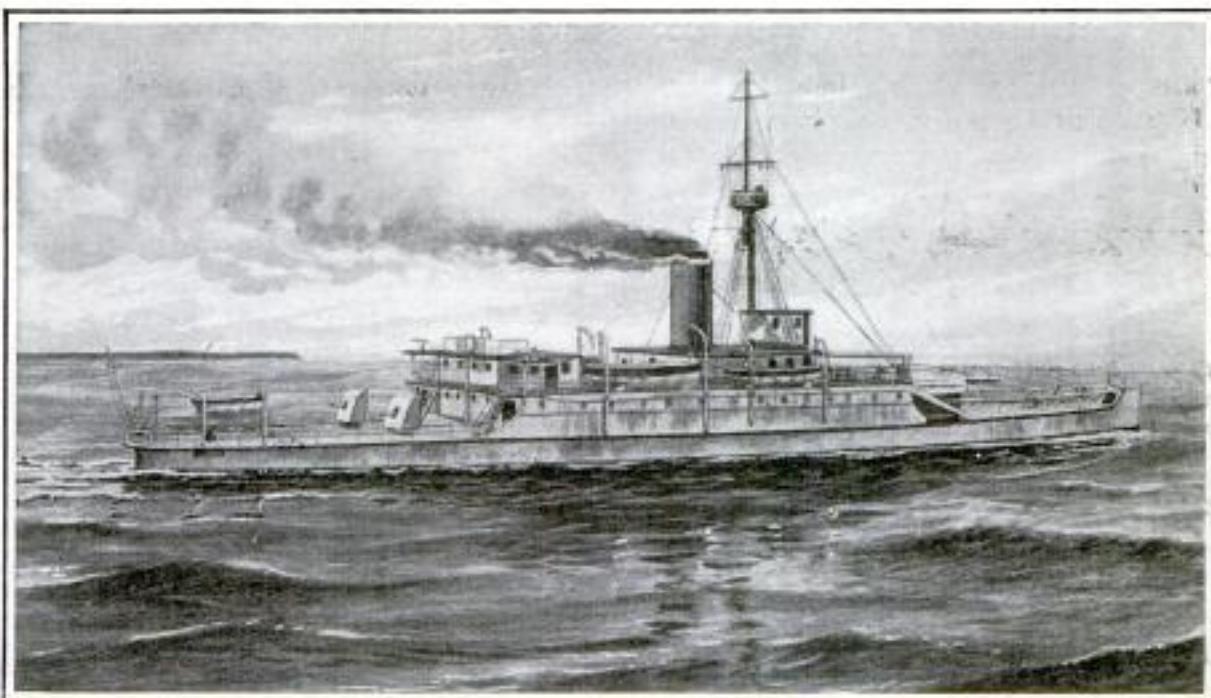
SAILBOAT USED BY STORE AS ADVERTISEMENT

To advertise a "white sale," a western department-store company made use of the implied pun and displayed



How a Pun in the Concrete was Made Use of for Advertising a "January White Sale"

a fully rigged white sailboat over the entrance of its building. The craft was 25 ft. in length and carried a 30-ft. mast and 25-ft. boom to support the sails, which were made of 10-oz. duck. In order to lessen some of the pressure exerted against the sails and eliminate the danger of the yacht being blown down, holes were cut in the canvas to allow the wind to pass through. Whenever the breeze became too heavy the sails were taken in and everything made secure on deck, as was also done each night.



One of the Three Monitors Built in England for the Brazilian Government and Taken Over by the British Admiralty for Service along the Belgian Coast; This Vessel Is Capable of Throwing One and One-Half Tons of Metal a Minute and, Because of Its Shallow Draft, Is Practically Immune from Damage by Torpedoes or Anchored Mines

attack. Torpedoes are ordinarily adjusted to run at a depth of from 12 to 15 ft. below the surface, and unless they are specially adjusted to run almost awash they will pass harmlessly under these monitors, as was demonstrated when a German submarine fired four torpedoes at one of the vessels. For the same reason a vessel of this draft will pass unharmed over an anchored mine. In spite of the fact that the monitors were built for river service, they have proved so seaworthy that they have been able to keep at sea in the rough waters of the English Channel when larger merchant craft were compelled to seek shelter.

Although the monitor originated in this country, vessels of this type are not now regarded as especially useful units of our navy. There are 10 monitors in commission, on the United States Navy list, the latest of these having been built from appropriations made in 1898, but most of them are on reserve duty.

Steel pipe has so far displaced wrought iron that the production of the former is nearly ten times as great as that of the older material.

SPACES FOR FLOWERS MADE IN CONCRETE WALLS

In designing a residence driveway which was to be cut through a terrace, a builder avoided the monotony of having two long concrete retaining walls flanking either side by breaking them at intervals with semicircular niches in which plants could be placed. These spaces were made so that they broke what otherwise would have been the straight line of the two copings. Each was made about 3 ft. in depth and 2 ft.

wide and given the same finish as the exterior of the wall. Concrete jardinières were made for the plants which were set in the spaces.

*Albert Marple
325 Boynton St.
Tropic, Calif.*



Copyrighted material

The Japan Magazine
**TATTOOING AS PRACTICED
 BY JAPANESE**

Tattooing, the art of decorating the human body with pictures applied directly to the skin, is one of the most ancient arts. In Japan, where it



In Japan It Is a Matter of No Little Pride with Certain Classes to Possess a Body as Elaborately Decorated as This One

reached its zenith during the first part of the nineteenth century, it is a custom which antedates the earliest records of the people. Although still carried on there, it is done in secrecy, as since the beginning of the reign of the late mikado, Mutsuhito, it has been prohibited by law. Curiously, this

modern edict against the practice corresponds to a similar command in the old Mosaic Law which put an end to it among the Jews centuries ago.

In Nippon this aboriginal custom has always appealed to the esthetic tastes of certain classes. At one time it reached a standing that placed its foremost practitioners in renown. Many of the famous painters of Japan were frequently employed to draw designs to be worked on the human body. Tattooing in Japan comes under three different classifications: the early practice of marking all criminals with characters which enabled the rest of society to identify them; the custom of lovers in their youth to have tattooed upon their forearms the names of their sweethearts in evidence of their undying fidelity; and lastly, "horimono," the practice of decorating practically the entire body with various elaborate designs. In northern Japan this is still persisted in, although the custom is said to be dying out gradually.

Horimono was never practiced among the higher classes of Japanese, but instead among those who on account of their vocations went for the most part unclothed, as was true of the jinrikisha men and many of the tradesmen, such as carpenters, plasterers, and the like. Singularly, the designs in this form of tattooing were influenced by the "irezumi," or the marking of criminals. The brand of the criminal was usually placed above the elbow on the left arm. For this reason the horimono practitioner has rarely decorated his clients' left arms, at least not heavily, beyond a point about two inches above the elbow, for fear that such a decoration might be construed as a covering for the label of the criminal.

Since the process of tattooing, which consists of pricking the skin with a small bundle of needles and allowing the ink to enter the cuticle, is a very irritating operation, a body well covered with an elaborate design is displayed with considerable pride by the youth of certain classes, as it shows that its possessor has endured

Mr. Poole, Los Angeles, Cal.
or Inventor A. J. Wren, Dayton, Ohio
G. American Linograph Co., Dayton, Ohio.

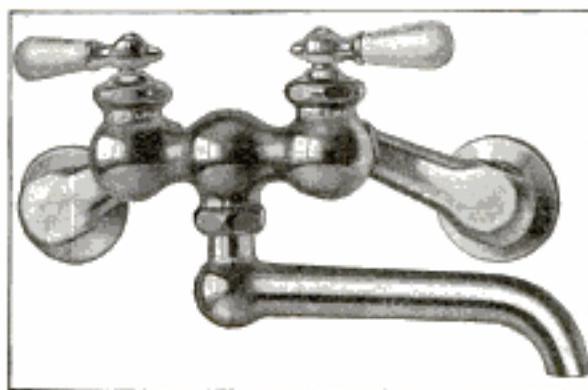
POPULAR MECHANICS

no little pain. For the most part red and blue inks are used in the work, because neither of the colors fade nor is liable to injure the skin. The designs most frequently used are those in which appear a tiger, a dragon, a famous old warrior or beautiful woman, or even birds and flowers.

Elaborate work is even now an expensive means of decorating the body for the man of Japan who earns only a few sen daily. Frequently a pattern takes months to execute and formerly often represented practically the entire earnings of a person. It is interesting in this connection to note that many of these designs are used by the Japanese today in their outer garments. At one time exhibitions of tattooing were held and largely attended for much the same reason that fashion shows are given in this country at the present time.

COMBINATION WATER FAUCET WITH SWINGING SPOUT

Intended to be used over a kitchen sink, a combination water faucet has been designed with a long, swinging spout which may readily be moved from one side to another as desired. In addition to this feature it has the convenient property, characteristic of all similar fixtures, of joining the hot and cold-water pipes so that the water may be mixed to any specific tempera-



The Spout of This Combination Water Faucet
may be Freely Swung from Side to Side

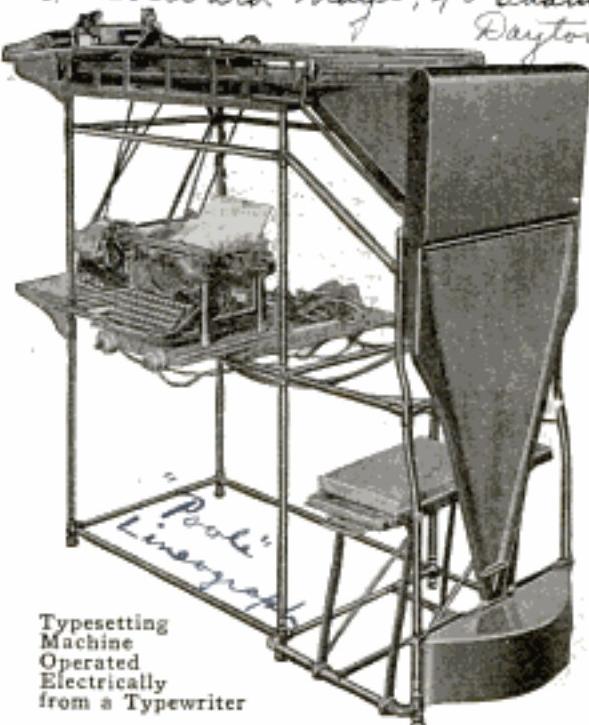
ture as it is drawn. The combined functions make the appliance a very convenient one for kitchen use.

Chicago Faucet Co.,
315 So. Clinton St.,
Chicago, Ills.

FORM-LETTER AND CIRCULAR PRINTING MADE SIMPLE

Intended particularly as an office appliance, a typesetting machine has lately been perfected which is operated

Edward Mayl, 4 Chambers St.
Dayton, Ohio.



Typesetting
Machine
Operated
Electrically
from a Typewriter

by a typewriter, making it possible for a stenographer, wholly unversed in printing, to perform the entire operation of setting type and printing ordinary business circulars and similar matter. This machine occupies a space 22 in. wide, 3 ft. long, and about 4 ft. high. When the typewriter is used it not only performs its ordinary function, but also, through electrical connections made by the movement of its keys, actuates a mechanism which simultaneously sets the type for printing the matter which is being written. Each time one of the typewriter keys is struck an electrical contact is made, causing the corresponding character in type to be set. When once the type is set, which requires no more time than the typing of the copy, the printing is done in much the same way as is multigraphing. A type distributor is also a part of the machine, and this replaces the type in its proper channels after the printing has been run off with a speed of 250 characters a minute. The

Poole is now at Dayton (40 Potomac St.) 2/6/15 (magl) Copyrighted material

Inventor: Chas. Barnard, 373 So.

Catalina Ave., Pasadena, Cal.

Infgr: E. E. Dow & Co., Redlands,

724

POPULAR MECHANICS

GERMANY AND BRITAIN BOTH BUILDING NEW NAVIES

typewritten copy which is made in the beginning is used in reading proof. Corrections are made by rewriting a line in which an error appears and substituting it for the one previously set.

PYRAMIDAL GLASS CASE FOR DRYING FRUIT

A cheap but efficient fruit drier, now being introduced in California, is designed particularly for the farmer who



This Cheap but Efficient Fruit Drier Exposes the
Fruit to the Sun on Three Sides

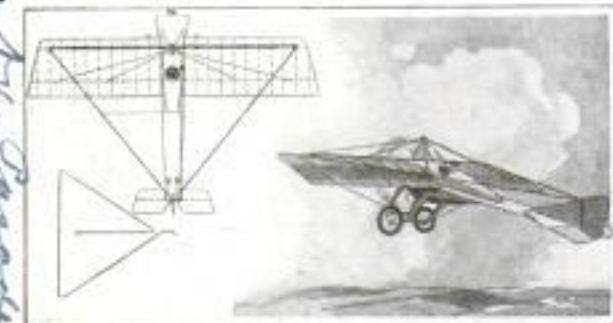
has only small quantities of fruit to dry. It consists of a table on which three triangular sheets of glass are mounted in the form of a pyramid, with the apex over the back of the table, and supported by a triangular sheet of galvanized iron erected on the back of the table. The inclosed space is exposed to the sun on three sides. The galvanized-iron back is provided with two small ventilators and with a door through which the trays of fruit are handled.

A new English postal regulation provides for the telephoning of the contents of important letters from the post office to the addressee on Sundays, for a small fee.

Both England and Germany are building new warships much more rapidly than their navies are being depleted by war. According to an American naval expert who has had an opportunity of observing the activities in British shipyards, 15 new battle cruisers, the newest and heaviest type of dreadnaughts, will be completed for Great Britain in 1915, with a supplementary fleet of light cruisers, destroyers, and submarines enough to make a navy as large as that of the United States. With these new vessels added to England's sea strength and approximately the same proportionate additions to the German fleet, the American navy will be insignificant in comparison.

WIRELESS APPARATUS USED ON AEROPLANES

Radio communication between aeroplanes in flight and the signal corps of an army on the battle field, embraces a comparatively new phase of wireless telegraphy which is being given a thorough test by military airmen in the European theater of war. The plant consists of three units: a generator and spark discharger, a transmission system, and a portable receiving apparatus, the aggregate weight of which approximates 184 lb. As is shown by the ac-



Wireless Equipment for a Monoplane, Showing the
Arrangement of the Antenna and Trailing Wire

companying illustration, the antenna is stretched over the upper pylon to the opposite wing tips of a monoplane, and back to the end of the fuselage, from

Aero and Hydro, 9-26-14
article written by Percy G.
B. Morrissey Copyrighted Material

Albert Marple, 322
Boynton St., Tropico, Cal.

POPULAR MECHANICS

725

which the aerial trailing wire is dropped. This does not necessarily come in contact with the ground, but is extended close to it under ordinary circumstances. It is attached to the transmitting apparatus, but so controlled by a releasing device that should it become entangled in a tree or other fixed object on the ground, a slight jerk would be sufficient to disconnect it from the machine, thereby averting an accident. The entire plant is mounted in the cockpit of the craft, and the generator placed in such a position that it may be driven by a belt running from the monoplane motor.

FROZEN RIVER ROADBED FOR ELECTRIC RAILWAY

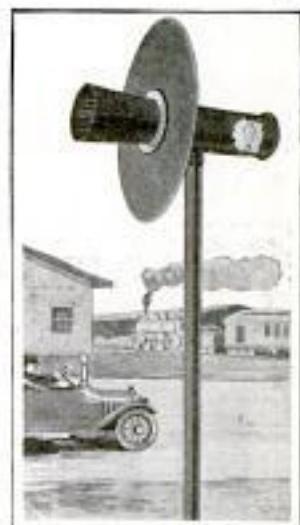
A novel means of transportation is used in Petrograd, Russia, during the winter months for relieving the congestion on the ordinary transportation lines. The river Neva, which flows through the city, freezes at the beginning of the season and remains frozen until the spring break-up. The smooth, solid surface of the frozen river furnishes an excellent location for a temporary but thoroughly practical electric railway, which is installed each year at the beginning of the winter and is kept in service until the ice shows signs of becoming unsafe.



Electric Railway Station
on the Ice of the River Neva
in Petrograd, Russia; This Railway
is Built on the Ice Each Year and
is Kept in Service throughout the Winter

ODD SIGNAL LAMP DEVISED FOR RAILWAY CROSSINGS

In different localities in the West a new danger signal is being used as an auxiliary safety device at railway crossings where gongs have been mainly depended upon in the past to warn traffic of approaching trains. The reason is that, while under most conditions a loud bell suffices, there are situations in which it is inadequate, a thing especially true in the case of motorists, who often open up their engines and cut out their mufflers on country roads, with the result that it is frequently diffi-



Underwood & Co.
417 Fifth Ave. N.Y. City.

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cult for them to hear a bell. The new signal consists of a red light which may be seen either during the daytime or at night. At the top of an iron pipe is mounted horizontally an 8-in. sheet-iron pipe, both the interior and exterior of which are painted black, and about the middle of which is a large red disk. Within the pipe, about $1\frac{1}{2}$ ft. from the open end, is a red lens, and behind this

an incandescent lamp backed by reflectors. When the lamp is ignited the red light may be seen for a half mile or more down a straight road, either at day or night. Its operation is the same as that of the average electric wigwag, the lamp lighting when a train enters a certain block, forming an electric circuit by contact with the rails.

9399

SEA SLED RIDES AT HIGH SPEED WITHOUT SPRAYING OR SKIDDING

Albert Niclson an designer
TAKING a spin on the water at a speed of 40 miles an hour with all the comforts of automobile riding is made possible by the sea sled, a new kind of high-speed craft that has just been developed. One of the features about this new kind of boat is that it does not throw spray on its occupants, as do most high-speed boats, but gathers the spray under the bow and rides on it. It does not trip or skid. It is not subject to knocks when running over choppy water, and the faster it is driven the more evenly it runs.

Instead of plowing through the water the sea sled rides on top of it, in this respect resembling a hydroplane, although its construction is radically different from that of a hydroplane. Instead of being flat or convex, the bottom of the hull is shaped like an inverted, rounded "V," while the bow, instead of curving to a point, is square and is of the same width as the stern. The original sea sled, shown in the illustration, was wider at the bow than the stern. Extending along each side was a plate having the appearance of a sled runner and serving to gather and hold the air and spray under the hull. With this construction the plates spread outward from stern to bow, resulting in water lines that spread outward instead of converging as in a displacement boat. This construction has been replaced by one in which the body of the boat is rectangular while the bottom is molded to provide the spreading water lines. In

*Vigor Now Murray & Tregurtha Co.
So. Boston*

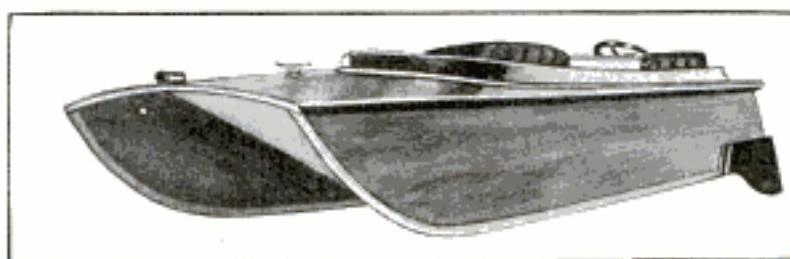
place of the usual submerged screw propellers the sea sled is equipped with "surface" propellers which dip a little less than half their diameters into the water when the craft is running at high speed. The rudders, of which there are two, are metal fins pivoted to the sides of the hull so that they project rearward from the stern. Each fin is carried, not on a vertical pivot, but on one that slopes downward and outward at an angle of about 30° with the vertical. The fins are worked separately by a horizontal rod which is moved back and forth horizontally by a gear at the center, this gear being controlled by a steering wheel of the usual type.

The sea sled is in effect a boat that has the bottom of its hull turned inside out, resulting in placing the keel higher than the sides. At the bow the opening between the hull and the water is made as high as the construction of the boat will permit for the purpose of catching as much air and spray as possible. Aft, the bottom is brought down to such a level as to give the boat a riding surface. With this arrangement there is no necessity for forcing air under the hull through pipes as is usually done with the hydroplane.

One result of this form of construction is that when the boat has a list it will steer of its own accord in the direction of the list and thus right itself automatically. When a displacement boat or hydroplane skids it is the bow that slides, and if the boat is going at high speed the result is almost

certain to be an upset. Take, for example, the case of a boat starting diagonally up the side of a big wave. If the boat has the usual displacement bow, the extra weight of water on the upper side will force the bow down to-

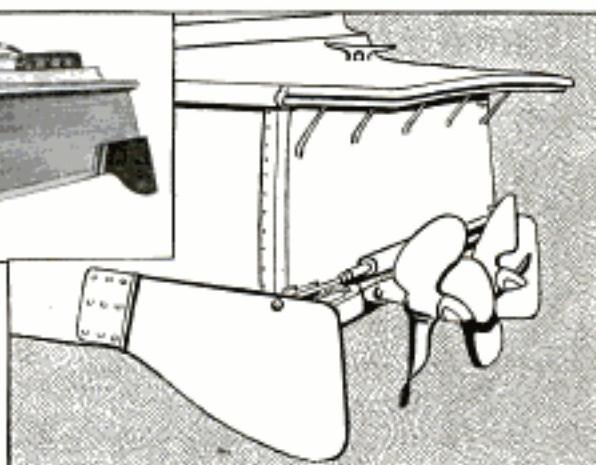
30 in. This makes it necessary to run the shaft through the bottom of the hull. This shaft with its fittings must be dragged through the water, and above a comparatively moderate speed, the power required for doing this may



This Picture of the First Type of Sea Sled Shows How the Hull is Shaped to Ride on the Water Instead of Plowing through It

ward the trough of the wave, a thing that can be prevented only by prompt and vigorous use of the rudder. A sea sled under the same conditions tries to nose in toward the crest of the wave and will continue to do this until its beam is on a plane parallel with that of the wave. The reason for this is found in the outspreading water lines. As the sides of the hull cut the water each throws a certain amount of water inward under the boat, with the result that there is an outward pressure on each side. The greatest outward pressure will be on the side where there is the greatest mass of water to be thrown inward, or on the side of the boat that is submerged the deepest. Full advantage of this tendency for steering purposes is taken by mounting the rudders on inclined pivots, as explained above. When the boat is to be turned to port, for example, the port rudder acts as an ordinary rudder and undercuts the water at the same time. This depresses the port side of the boat. The port side of the hull is then under the greatest outward pressure from the water so that the bow turns automatically to port, aiding materially in the action of the rudder. For this reason the sea sled is one of the easiest of boats to steer. It also presents the curious spectacle of listing, like a bicycle, in the direction of the turn.

In most racing boats and hydroplanes the propeller is submerged about



The Arrangement of the Steering Fins and Surface Propellers

be more than that for driving the boat over the water. This resistance is done away with when surface propellers are used. The shafts of the two propellers, geared to revolve in opposite directions, are run straight out through the stern. This places the propellers so that only the portions below the shafts are submerged, but the loss of driving power due to this cause is largely counteracted by making the blades of large area. An incidental advantage in the surface propeller is that the boat can be run in shallow waters, and among weeds and water plants.

The greatest speed yet made by a sea sled is around 43 miles an hour. At higher speeds than this the boat gets to planing so high that it loses its planing surface—that is, the air escapes suddenly from the cavity under the boat and it drops back to the water. It is thought that this restriction in speed may be overcome by further improvements in the shape of the hull. The ordinary hydroplane works satisfactorily at weights not in excess of 45 lb. to the horsepower, while some of the latest sea sleds are capable of running at high speed with weights of as much as 70 lb. to the horsepower.

E. D. Fannington, Weymouth Heights, Inventor: Samuel P. White
Mass. Bloomington, Ill.

Fred Telford, 605 S

Douglas Ave., Springfield, Ill.

LAWN SPRINKLER THAT WETS
A LARGE AREA

A new lawn sprinkler is designed with the idea of enabling one man to take care of several acres. The sprinkler proper consists of several lengths of pipe joined together, making a string of any desired length. The pipes are perforated and in each perforation a small nozzle is set, while the supports are such that the pipes can rotate back and forth easily. The pipes are supplied with water through a small hydraulic device carried on a two-wheeled truck, and this device swings back and forth under the pressure of the water. The pipe line is rigidly attached to this so that the tiny streams of water are constantly thrown back and forth across a strip 50 or 60 ft. wide. When enough water has been supplied to the strip, the pipes are disconnected and laid across racks on the truck, and the whole is trundled to a new location.



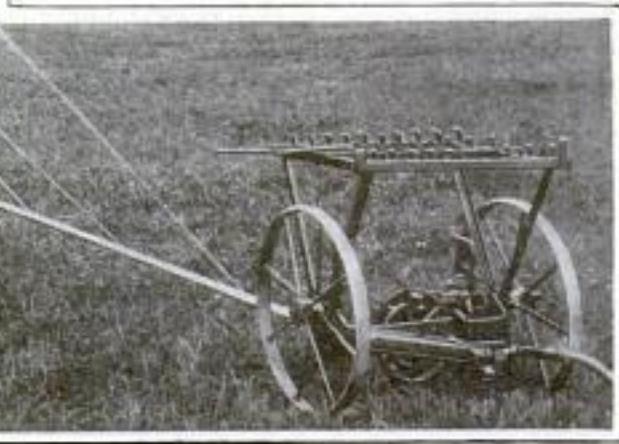
A Hydraulic Device on the Truck Rotates the Pipe Back and Forth so That Water is Supplied Evenly to a Strip 50 or 60 Feet Wide

HEAT-EQUALIZING DEVICE
FOR STEAM SYSTEMS

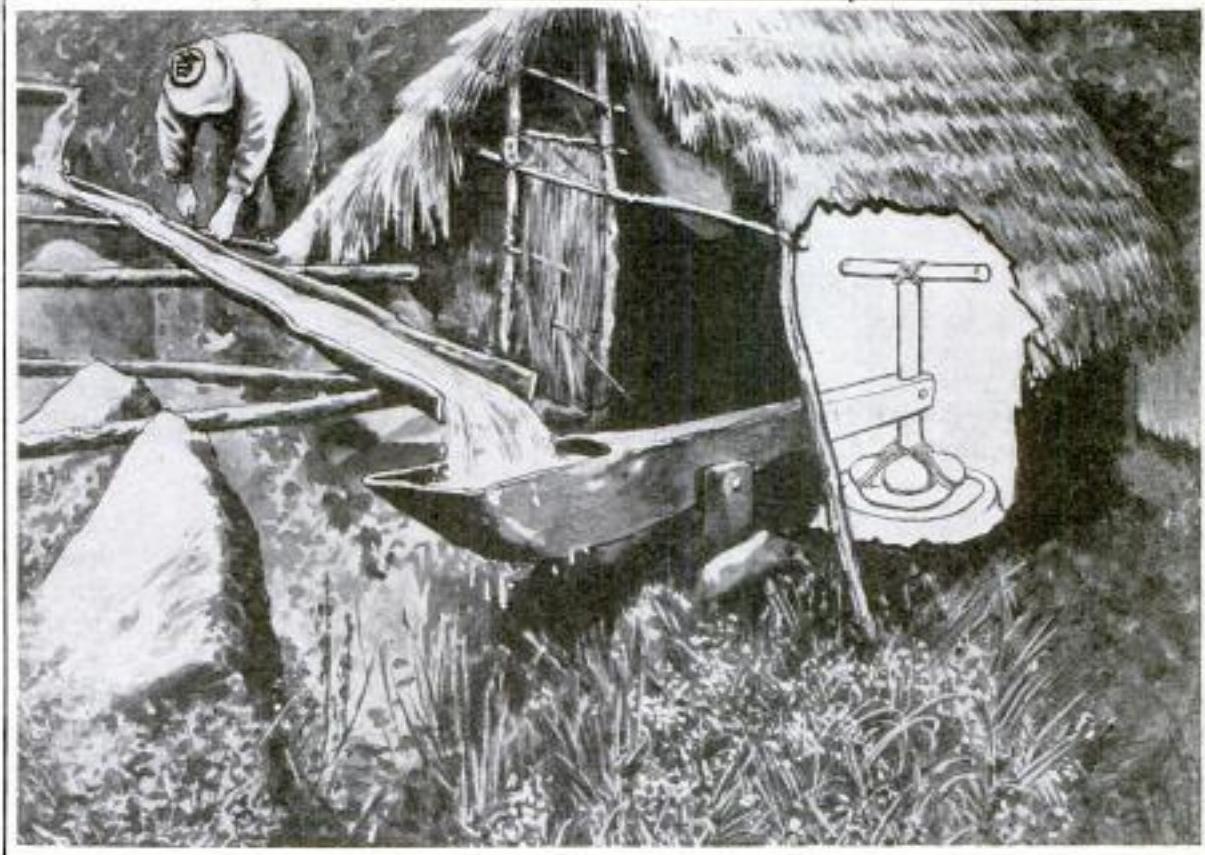
Designed for use with underground steam systems, such as are employed in serving groups of buildings or apartment houses from a central plant, a new method of heat distribution has been devised which bears essentially the same relation to large heating systems as high-tension feed wires bear to electric-transmission lines. The purpose of the apparatus is to equalize the heat so that buildings situated at a distance from the supply station will be served just as efficiently as those close to it, which is not always the case with a low-pressure system used in this manner. In the new plan a small, high-pressure tube is contained within the ordinary supply pipe and at stated intervals is fitted with automatic valves which operate whenever the pressure in the larger conduit falls below a certain minimum, feeding in a sufficient quantity of steam to equalize the heat at the required points. The system can be installed in old plants.

HOW JAPANESE USE WATER POWER TO HULL RICE

A crude but effective apparatus for utilizing water power in hulling rice is in common use in the rice-growing sections of Japan. It consists simply of a beam that rocks on a pivot and has a bucket at one end and a pounder for hulling the rice at the other. The



Geo. F. Worts, 927 Grand Av., Toledo, Ohio.



This Crude Water-Power Plant Works Slowly but Needs Practically No Attention

water is supplied through a trough, which empties into the bucket, and no head is required other than that necessary for maintaining the flow. As the bucket fills, the weight of the water forces it down, raising the pounder at the other end of the beam. The bucket is so shaped that when it reaches the low point the water spills out suddenly and the beam flies back to its original position, the pounder falling into the bowl-shaped receptacle with sufficient force to break the hulls from the rice. The apparatus works slowly, but requires practically no attention.

FLOWERPOTS ORNAMENTED WITH SEA SHELLS

The making of flowerpots from sand and cement in which sea shells, picked up along the ocean front, are imbedded is a novel occupation followed by an old man near San Diego, Cal. With the many kinds of shells picked up a great variety of effects are produced.

*Allen Henry Wright
San Diego, Cal.*

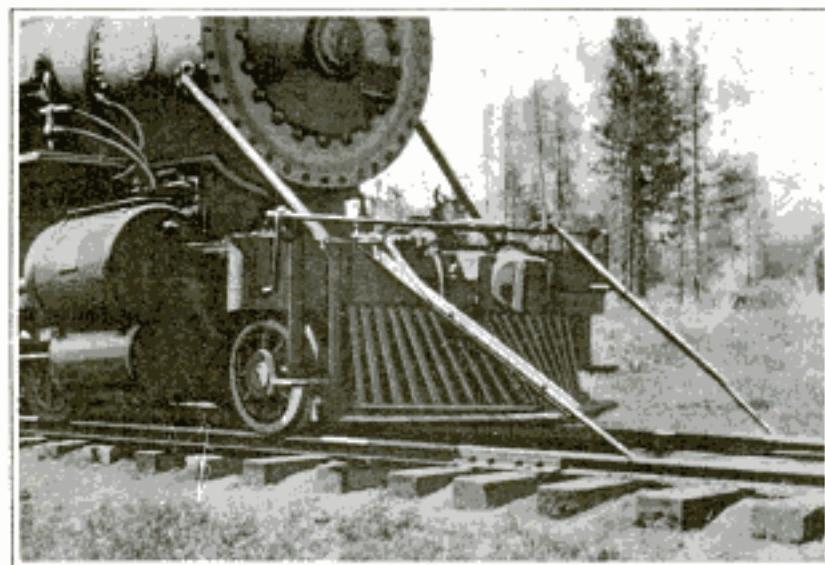
In some cases the shells are left sticking to the outside of the flowerpot, and in others they are sunk into the composition so that the rims are flush with the surface. Ordinary dishpans are used as molds, and some novel and attractive patterns are worked out for sale to tourists and beach residents.



These Flowerpots are Made of Sand and Cement and are Decorated with Sea Shells Sunk into the Composition While It Is Wet

**CLEARING RAILWAY TRACKS
OF CATERPILLARS**

During an almost unprecedented plague of caterpillars in northern California, railroad tracks were so thickly covered with the small, hairy creatures



By Blowing Steam through Pipes from the Locomotive Boiler to the Rails, Caterpillars were Cleared from the Railway Tracks without Difficulty

fornia, railroad tracks were so thickly covered with the small, hairy creatures

that in some parts the movement of trains was seriously interfered with and sometimes became dangerous on heavy grades where it was impossible to prevent the wheels from slipping even when the brakes were locked. The problem of clearing the tracks of the pests in advance of a train was solved by extending two pipes ahead of the pilot of the locomotive and directing a high-pressure jet of steam on each rail. The steam was expelled with sufficient force to blow the caterpillars from the track, while its heat was great enough to kill them almost instantly. This simple method put an end to the difficulty and saved the expense

of cutting ditches for miles to prevent grubs from crawling to the rails.

Wm. H. D.
**ONE-MAN HOUSE A CURIOUS
STRUCTURE**

When the authorities ordered the removal of a partly completed wooden building in a suburb of Cincinnati, a



Corner of "White House" Built by One Man and Then Torn Down by Him When the City Authorities Ordered Its Removal

novel building enterprise on which a civil-war veteran had worked for seven years, and to which he had devoted the most of his pension money, was rudely brought to an end. Every board was cut and every nail was driven by this man working alone. He called it his "White House." When the structure had begun to take definite shape, and its crude lines were seen to follow the contour of the executive mansion in Washington, the reason for this name was apparent. This one-man house was within a few weeks of completion when two inspectors appeared on the scene. The house was found to have been built in violation of the building ordinances, and an order was issued for its removal. The man who built it then proceeded to tear it down, saving the material carefully for use on another location. When only as much of the building as is shown in the illustration remained standing, he quit work.

Oscar A. Doob, Times Star, Cincinnati, Ohio.

moon Motor Car Co., Main & Cornelia Sts.
St. Louis, Mo.

motor age 11-5-15

SURE-FOOTED BURRO REPLACED BY MOTOR CAR



THIS photograph shows a motor car at the apex of Eagle Rock Mountain, a peak with very precipitous sides, near Los Angeles. The feat of climbing it is one which requires not only an engine with power, but also brakes that hold and a driver with a clear head, as may be appreciated by the position in which the machine is standing, one of its wheels being within a hair's breadth of the edge of the cliff. This spectacular piece of hill climbing was accomplished for the purpose of demonstrating the flexibility of a stock car, and also illustrates in a striking manner the tremendous advancement made in gasoline-propelled vehicles.

732

POPULAR MECHANICS

~~Scientific American~~ ARTISTIC LAMP-POST MADE

9289 FROM LIMB OF TREE

8879 In front of a California bungalow is a rustic lamp-post which is not merely odd in appearance, but also fits well with its surroundings. It is made from a crooked limb of a tree and is surmounted by an artistic lantern made of brass. The electric wires are run under the ground through a conduit and up through the interior of the post, which has almost the appearance of having grown in its position instead of having been placed there. The novel effect obtained is



not unpleasing, although somewhat startling when first observed.

THE TWELVE-CYLINDER CAR 9289 NOW A POSSIBILITY

With the eight-cylinder car barely introduced, automobile manufacturers are now talking of the 12-cylinder car, one maker having already thrown out the hint that "if the public demanded a 12-cylinder car," his company was prepared to make it. There were 14 eight-cylinder cars exhibited at the automobile show held in Chicago in January, 1915, but so far as is known there is only one 12-cylinder model in existence, and that is a British racing car. Just whether the advantages to be derived from the use of 12-cylinder engines will compensate for the increased complexity of the mechanism is a thing that can be determined only by experience.

Scientific American

TO EXHIBIT ALBINO CATTLE

8679 AT SAN FRANCISCO

Some of the famous Chillingham white cattle are to be exhibited at the Panama-Pacific Exposition if plans now being made are carried out. The ancestors of this herd were shut up in Chillingham Park, England, in the year 1220, and since then there has been no infusion of new blood and no change in the characteristics of the cattle. They are albinos, with snow-white bodies, black noses and horns, and red ears. These cattle are an albino offshoot from the aurochs, the extinct black wild ox from which all the domestic cattle of Europe are descended, and they still show traces of their descent in the colored nose, horns, and ears. The albino trait has been preserved for nearly eight centuries only by keeping them rigidly separated from other cattle.

STAMP-VENDING MACHINES

8671 USED IN CANADA

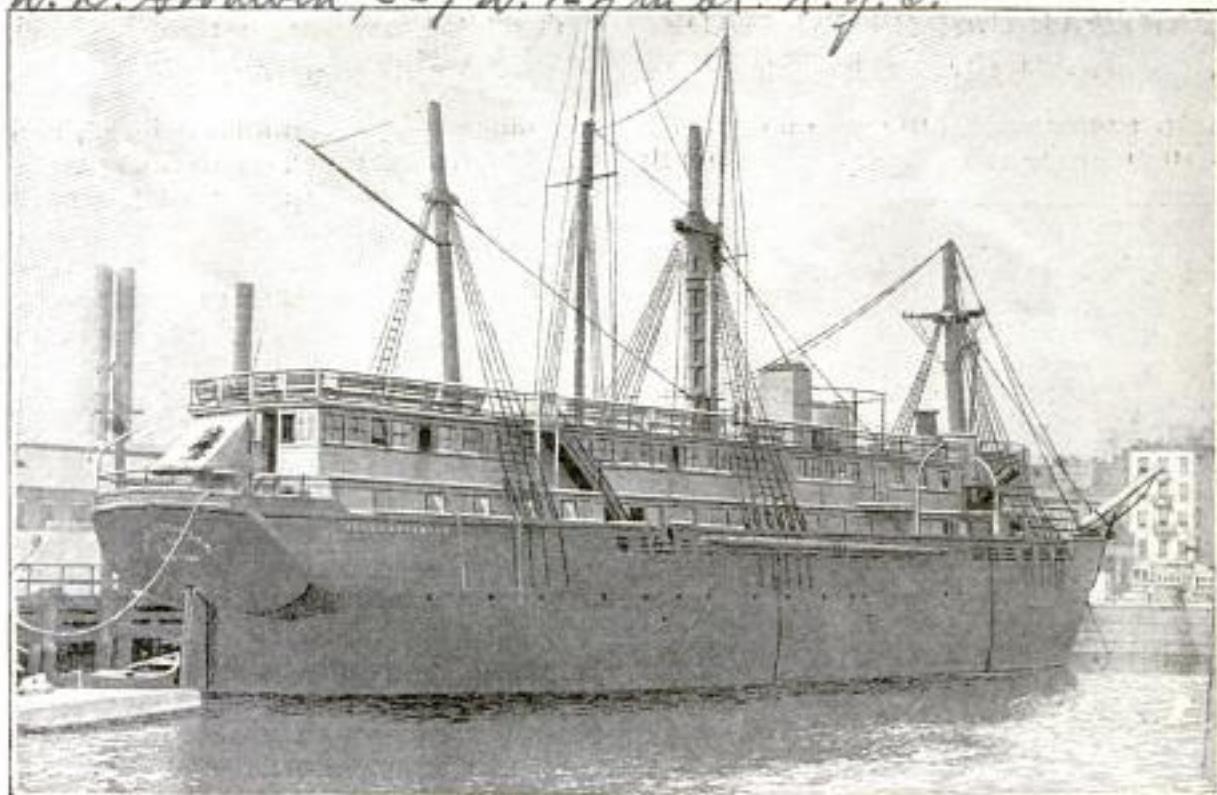
Combination letter boxes and vending machines that dispense one-cent and two-cent stamps are being introduced by the Canadian government. When a coin is deposited in the machine the stamps are fed forward from a roll and are torn off in a strip by the purchaser. As soon as the supply is exhausted, a metal shield bearing the word "Empty" drops over the coin slot. The machine is operated by electric current, which also furnishes the light for illuminating the advertising placed around the top.

O. L. Robertson

44 Riverside Ave.,

Toronto, Canada.

W. D. Goodwin, 527 W. 12th St. N.Y.C.



New York's Floating Hotel Which has been Raised and Again Opened as a Home for
About 75 Girls and Young Men

SCHOONER HOTEL FOR NEW YORK POOR

One of America's odd hotels, a five-deck schooner which served as a home for some 75 girls and young men employed in New York, has been raised and again put in service. Several months ago, while taking on a supply of coal, the boat sprung a leak and settled into the mud at its mooring place in the Hudson River at the foot of East Twenty-Third Street. The vessel is an obsolete, timbered craft which has seen more than 50 years of service and is owned by the estate of a famous coffee merchant. It is not operated for profit, but to provide an economical home for worthy young persons. For 12 years the boat has been moored at its present dock, and all that time served as a hotel. It has its own electric-light plant, dining, smoking, and recreation rooms, and is comfortably fitted and heated.

Lightning, campers, locomotives, and incendiaries, in the order named, are the most frequent causes of forest fires.

CHISEL TESTED BY DRIVING IT THROUGH STEEL BAR

A hand-forged chisel with a tapered point, made from cropped ends of steel such as are used in shrapnel cases, was recently driven through a 2-in. cold steel bar with a sledge. The operation required only 15 minutes and was performed by a blacksmith and his helper, the one holding the chisel with a pair of tongs and the other wielding the sledge. After penetrating the block of steel the chisel was withdrawn and found to be in perfect condition, neither end of the tool showing any marks which would indicate that it had been used.



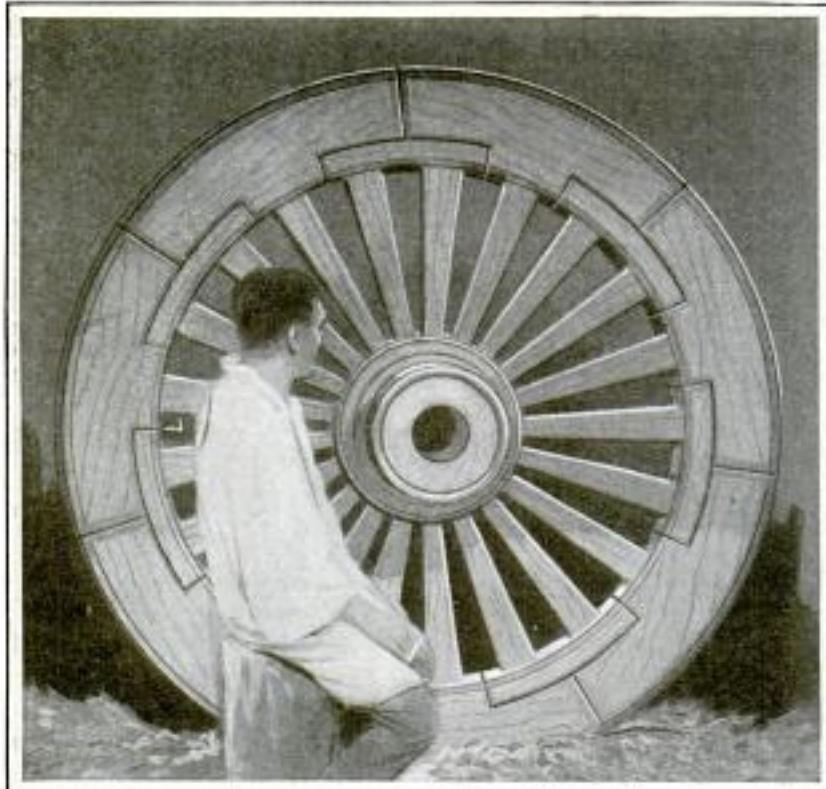
*Pennsylvania Steel Co.,
Steelton*

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FUNERAL CAR OF JAPANESE EMPEROR

9049 An ancient and impressive Japanese custom brought to light by the death

bers of one family, in which this duty has been a hereditary honor for generations. The length of the car is always $23\frac{1}{2}$ ft.; the width, $10\frac{1}{2}$ ft., and the height, 12 ft. The wheels are of unusual pattern, each having a rim built in seven sections, with the idea of doing away with all jolting. There are three spokes to each section, and the sections are joined by plates placed on the inner side of the rim. The result is rather curious in one way, since each section has a separate and distinct squeak. The car is drawn by two oxen with three in reserve following the car. The car must be strongly built, as the emperor's coffin weighs between four and five tons, consisting of three caskets placed one within the other. The inner casket is made of Japanese wood, 3 in. thick, and covered with vermilion.



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One of the Wheels of a Japanese Imperial Funeral Car: The Rim is Made in Seven Sections with the Result That the Wheel Has Seven Separate and Distinct Squeaks

of the late emperor is that of building the imperial funeral car. When an emperor dies, a new funeral car is always made. It must be built to exacting specifications and only by mem-

This casket is placed in the second casket, and the intervening spaces are filled with charcoal. These are then placed in the outside casket, and the spaces are filled with granite.

6808 SHORT CUT ACROSS CANADA FOR SEAGOING VESSELS

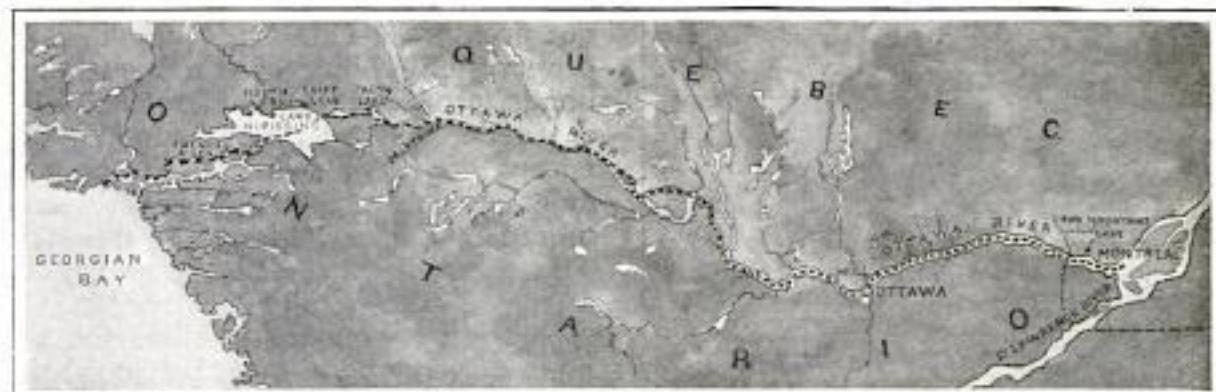
The next great waterway scheme to be carried out, according to present indications, is the Georgian Bay Canal, which is to connect Georgian Bay with the St. Lawrence River at the head of navigation for seagoing vessels near Montreal. This canal will not only give vessels from the Atlantic direct entrance to Lakes Huron, Michigan, and Superior, but will reduce by nearly one-half the distance traveled by water-borne shipping in going from the northern part of Lake Huron to Mont-

real, eliminating the present indirect route by way of Detroit, Lake Erie, the Welland Canal and Lake Ontario. The canal will utilize for the greater part of its length a continuous chain of natural lakes and rivers. The total length is 449 miles, and over only 30 miles of this will it be necessary to construct a new waterway, although much of the existing waterways will require dredging. The total cost of the canal is estimated at less than \$150,000,000.

Engineering Supplement London Times 2-6-14
The Engineer (London) 2-6-14

The canal begins in Georgian Bay at the mouth of the French River and follows up this river to Lake Nipissing. In this 83-mile stretch there are to be three locks with a total lift of 70 ft.

Lake Nipissing to the St. Lawrence is 633 ft. The canal is to be 200 ft. wide at the bottom and to have a maximum depth of 22 ft., while each of the locks is to be 850 ft. long and 65 ft. wide



Proposed Georgian Bay Canal, 449 Miles Long, Which is to Connect Lake Huron with the St. Lawrence River and Provide Direct Access for Seagoing Vessels to the Great Lakes Ports

At North Bay, on Lake Nipissing, extensive wharves and grain elevators will be built. A canal connecting the east shore of this lake with the Mattawa River will be excavated. This canal will pass through Turtle, Talon, and Trout lakes and will comprise the heavy portion of the excavation. It is planned to lower these lakes to the level of Lake Nipissing and to make the latter the summit in order to utilize its inexhaustible water supply for lockage purposes in both directions. In the 13 miles of the Mattawa River are two waterfalls, the Paresseux and Les Chines, and these will be passed by a series of five locks. The waterway then follows down the Ottawa River, in which a total of 15 locks will be installed. The last lock is at the lower end of the Lake of Two Mountains, which is the outlet of the Ottawa River into the St. Lawrence River. Leaving this lock, the route follows Back River on the north of Montreal to a junction with the St. Lawrence River at Bout de l'Isle, about 12 miles below Montreal. By using Back River the construction of a new channel and of wharves in front of Montreal sufficient for handling the enormous traffic that will use the new route is avoided, while a new and important commercial frontage will be opened along the north side of the city. The total fall from

and to have a depth of 24 ft. of water over the sills.

The hydroelectric power that can be developed along the canal is estimated at 1,000,000 hp., and it is believed that with the growth of new towns and industries the sale of this power will provide a revenue sufficient to pay most of the interest on the investment for building the canal. About 70 hours will be required for making the journey from Georgian Bay to the St. Lawrence River. It is estimated on good authority that the trade flowing from the Great Lakes to the Atlantic seaboard at present represents 72,000,000 tons a year and that this is doubling itself every six years. About 80 per cent of this shipping is American-owned, and a large part is now diverted at Buffalo and shipped to Atlantic ports by rail.

DOORS OF STOCKMAN'S BANK PICTURE RANCH LIFE

Each of the doors designed for a recently completed bank building at Austin, Tex., which is owned by a stockman, is divided into three bas-relief panels depicting scenes typical of those on southwestern cattle ranches. Together they weigh approximately 2,600 lb. and represent an expenditure of \$4,000. Photographs were taken on

H. E. Zimmerman, At. Morris,
Bank Bldg. owned by Maj. C. W.
Littlefield, Austin, Texas.

one of the ranches owned by the cattleman, and these were used by the artist in laying out his work. At the



These Bank Doors Picture Scenes Typical of Those to be Seen on Southwestern Cattle Ranches

top of the doors appears a group of cowboys; in the middle, a round-up; and at the bottom, a typical grazing scene. Small bronze heads of steers with lasso nooses about their necks form the knobs for the doors.

OXYGEN MAY BE STORED WITHOUT PRESSURE

By the use of some of the commercial preparations of fused sodium peroxide, oxygen can now be stored without pressure. This substance has the property of holding oxygen in chemical bonds, from which it is released by the action of water. A pound of the peroxide will hold 3.2 cu. ft. of gas, or enough to supply the breathing requirements of a man for 30 minutes. The application of this discovery to diving and life-saving appliances is said to be entirely practical, since the sodium peroxide, while hard, is not brittle, and can be cast into any convenient shape. When charged with oxygen it may be stored without danger of deterioration if protected from moisture.

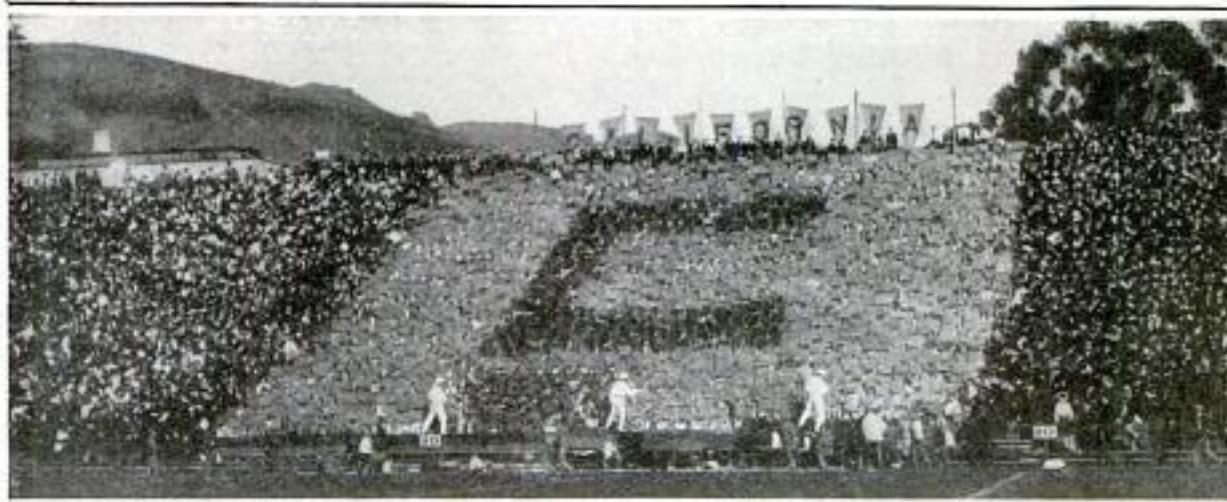
MUCH PIPE WOOD IS USED BY PENNSYLVANIA

Pennsylvania leads all of the states in the consumption of wood for use in the manufacture of pipes. Of the different kinds of material employed, apple wood is in greatest demand, for it is the principal wood used in making the so-called brier pipe. The accompanying photograph shows the evolution of an ordinary pipe bowl from a blank of brierwood, which is purchased at about \$350 a thousand feet. The other woods that are used, aside from this and apple, are red gum, ebony, birch, and olive. The state each year consumes in pipe making the equivalent of approximately 225,000 board feet of timber, the average price of which amounts to about \$65 a thousand feet.

*Bristow Adams
Forest Service, Wash. D. C.*



The Evolution of a Pipe Bowl from a Slug of Brierwood



The Great "C" Formed in Blazing Color by University of California Students at a Football Game

DISPLAY COLLEGE COLORS IN SPECTACULAR WAY

At a hotly contested football game between the University of California and Leland Stanford University, a very striking method of displaying their colors was adopted by the "rooters" of the former institution. The students were seated in a solid block on the bleachers, and each held a rectangular flag which was blue on one side and yellow on the other and held at either end by a stick. In the center of the block a series of the seats had been marked off to form a large "C." In this way the rooters were divided into two groups, those forming the "C" and those constituting the background. Then, by each student holding back his flag so that it covered his head and shoulders, every one in that section of the bleachers was hidden from view beneath a glare of color. When one group of the rooters were displaying the yellow side of their flags, the other would display the blue. So the great "C" in the center appeared one minute in a brilliant yellow and the background in blue, and the next minute in blue with a yellow background. The changes were made in unison, each rooter following the direction of the cheer leaders.

A metronome watch for gauging the speed of marching troops has been introduced in the Austrian army.

HOUSE IN NETHERLANDS HAS ROOMS THREE FEET WIDE

So valuable is land in the crowded countries of Europe that even a space, 4 ft. wide, between two buildings in one of the main thoroughfares of Amsterdam, Netherlands, is made to serve as a dwelling. The thickness of the walls eats up a foot of this space, so that this strange house is only 3 ft. wide inside. The front of the lower floor is occupied by the stairway. In the narrow rooms of the upper stories a family lives in comparative comfort.

An aeroplane recently built for the Italian army has engines of 300 hp., a lifting capacity of 11,000 lb. useful load, a speed of 75 miles an hour, and is capable of sustained flight for 25 hours. Two other giant planes, one of 600 hp. and the other of 1,000 hp., are also being built in Italy.



D. S. Rockwell, Western Military Academy, Acton, Mass.

A. A. Court
Republic Bldg.,
St. Louis, Mo.

738

POPULAR MECHANICS

Aut. 1914
The Motor - November 1914

PROPER ELECTRIC WIRING

8767 FOR MOTOR CARS

Attention has lately been drawn to the relative merits of single and double wiring of electric-lighting equipment on motor cars, and the good opportunity afforded by the metal chassis of a machine for grounding has caused the single-wire system to be suggested as possibly preferable to that now in general use. One of the reasons for this is that more substantially insulated connections could be made at the lamps. It is also always possible in double wiring for leaks to occur which are not great enough to blow a fuse, but sufficient to cause a drain on the battery. With the single-wire system the fuse is burned out almost always by a short circuit, and this gives an immediate warning of trouble, enabling it to be looked after before damage is done.

(A cement for fastening metal to marble is made of 30 parts plaster of paris, 10 parts iron filing, and $\frac{1}{2}$ part of sal ammoniac, mixed and reduced to a paste with acetic acid.

TORPEDOES AND BOMBS USED IN AERIAL RAIDS

9141

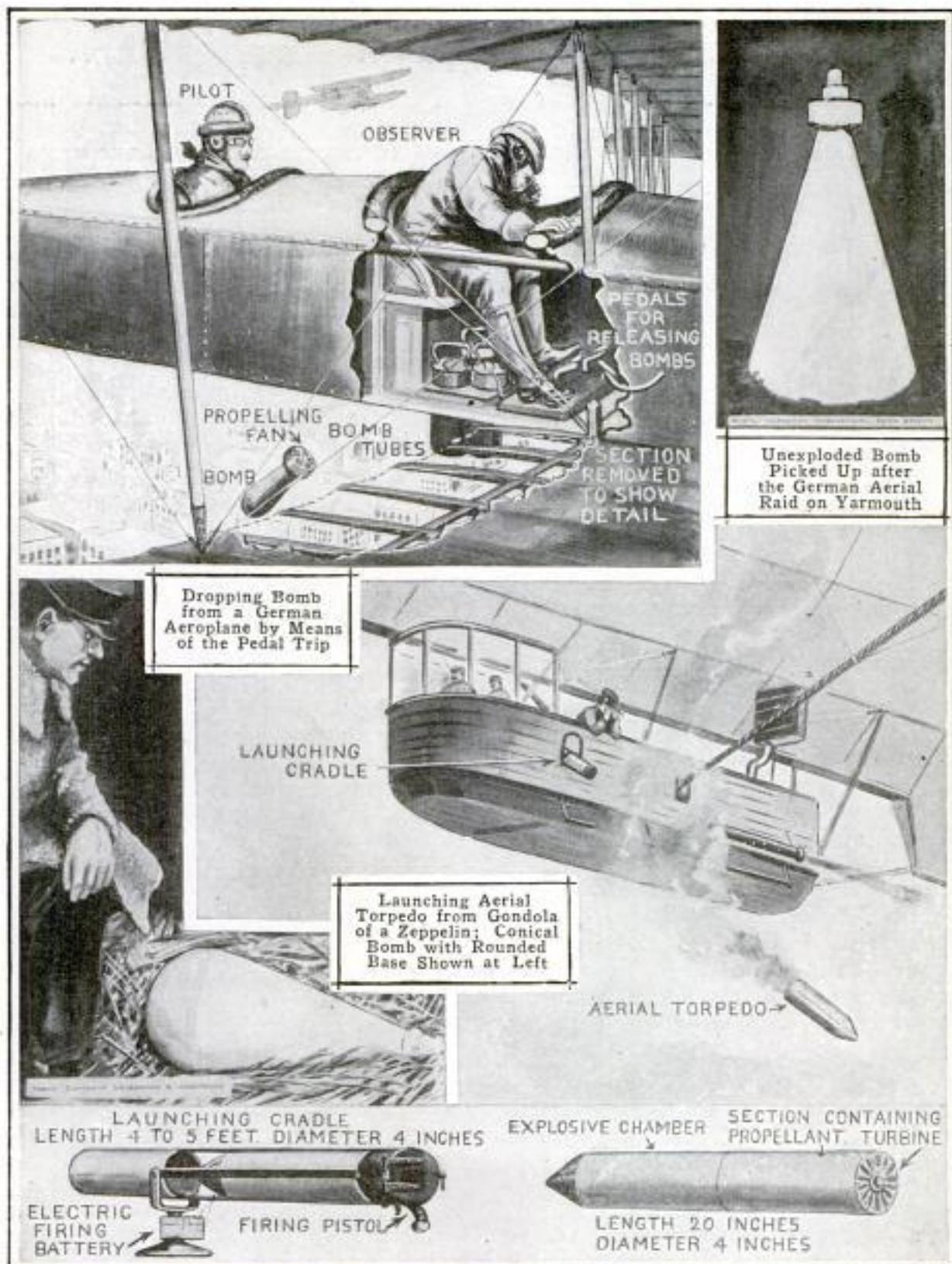
A new instrument of destruction brought to light by the German airship raids on England is a self-propelled aerial torpedo that in many ways resembles a submarine torpedo. It is launched from the gondola of a Zeppelin through a special launching tube that is mounted on a universal joint so that it can be swung at any angle and fired in any direction. The torpedo is launched from this tube by an electrical device operated by a trigger, and, with proper allowance for the speed of the Zeppelin, the shell can be hurled at a given mark with great accuracy. Its great advantage lies in the fact that it can be fired forward, broadside, or astern, and not simply dropped, as is the case with the old-style aerial bomb.

The torpedo consists of a pointed

shell, approximately 4 in. in diameter and 20 in. long. In the nose is carried a high explosive, thought to be trinitrotoluol, which is fired by a percussion cap on contact. Back of the explosive is a compartment containing about $4\frac{1}{2}$ lb. of a slow-burning compound which is probably composed of sulphur, saltpeter, charcoal, and a vegetable oil. When ignited, this compound gives off gases which operate the turbine at the rear of the torpedo. The turbine drives the torpedo through the air at high speed and also gives it a rapid rotating motion similar to that of a shell fired from a rifled cannon. The burning compound leaves a trail of smoke behind the torpedo, but produces no flame, so that there is little or no danger to the airship from the firing of the torpedo.

The Sphere ref 6-14

12/26/14

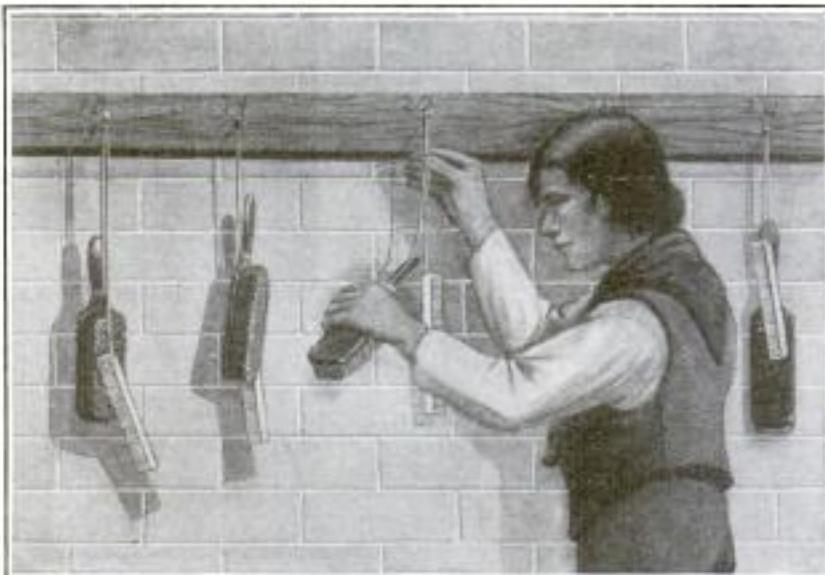


In addition to these, the Zeppelins, as well as the German aeroplanes, carry the ordinary aerial bombs which are simply dropped. Until recently these were thought to be spherical in form. Two unexploded bombs picked up after

the raid on Yarmouth are conical in shape, the base of one being flat and that of the other rounded. The latest aeroplane equipment provides vertical tubes for carrying the bombs, which are released by pressure on pedals.

TEACHING INDIAN PUPILS TO
8999 BE CLEANLY

Cleanliness is one of the things upon which particular stress is laid by the instructors in the government's Indian

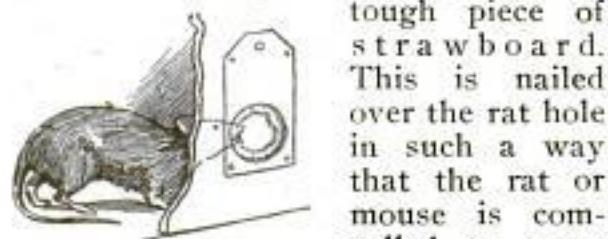


Combs and Brushes are Provided for All the Pupils at This Government Indian School

schools. At one of these institutions which is maintained for the benefit of the resident Indians in the Salt River Valley of Arizona, a somewhat curious method is followed in drilling the pupils in the practice of brushing their hair regularly. On one side of the school building there is a long, narrow board bearing a series of numerals, beneath each of which is a peg. Suspended from these are a comb and brush for each of the pupils, and their use is a part of the daily routine.

POISON BUTTON NAILED
8984 OVER RAT HOLE

A new feature in rat poison is a button filled with poison and glued to a tough piece of straw board.



This is nailed over the rat hole in such a way that the rat or mouse is compelled to gnaw through the button and eat the poison in order to get out.

*american Sanitary Corporation,
mfgs., Memphis, Tenn.
N. Mitchell 611 Mission St.,
San Francisco, Cal.*

Daily Counselor & Trade Reports
1-22-15

Reported by General George

MECHANICS H. Scidmore

yokohama, Japan

RUSSIAN SOLDIERS WEAR

923 JAPANESE PAPER SHIRTS

Paper shirts made in Japan and now being used in large quantities by the Russian army are said to have proved particularly valuable, because of their warmth, in the winter campaigns in Poland and East Prussia. The paper used is the "hashikirazu" paper made from mulberry bark in accordance with a process described in a recent number of this magazine. Paper clothing, known as "kamiko," has long been in use among the Japanese. Such clothing is both cheap and serviceable, its only drawback being that it cannot be washed. The

paper is warm and soft, but has little "size" in it, and for this reason a thin layer of silk wadding is placed between two sheets, and the whole is quilted when it is to be used for clothing.

REFRIGERATED CHURCH IN
377 A TEXAS TOWN

In Orange, Tex., where the summer temperature often reaches an uncomfortable degree, an enterprising religious organization has devised a way of making its church the most comfortable place in town on a hot Sunday. This is done by means of a refrigerating plant, set up in a small building in the rear of the church edifice. The cold-brine pipes are coiled in the church basement, close to a big ventilating fan. Outside air is sucked in by the fan, passing first through a water spray to cleanse it of dust, then through the refrigerating pipes and on up to registers located in various parts of the auditorium. The temperature averages 20° lower than outside. In winter, steam is used in the pipes instead of brine.

L. S. Dennison

1400 River St.

Hyde Park, Mass.

material

POPULAR MECHANICS

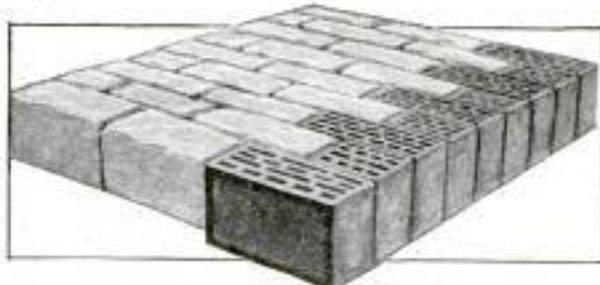
PINE TREE WORTH NEARLY ONE HUNDRED DOLLARS

One of the costliest trees on record is a sugar-pine tree cut in trespass from the Stanislaus National Forest in California, for which the government exacted a payment of \$99.40. This tree scaled 18,933 ft. board measure, and contained more than enough lumber to build a good-sized suburban frame house, or to build a 2-ft. board walk nearly two miles long. In spite of its high cost the lumber was valued at only \$5.25 a thousand feet, which is a lower figure than national-forest lumber is often sold for. This is believed to be the first case on record in which a single tree felled in a national forest was valued at anything like \$100 on the stump.

CAST-IRON PAVING BLOCKS

FOR BROOKLYN BRIDGE

To provide a roadway that will stand up under the heavy traffic that constantly passes over the narrow roadway of Brooklyn bridge, a new type of paving block consisting of a cast-iron shell, shaped somewhat like a building block and having the openings filled with concrete, has been placed in service. With the best paving material that could be obtained heretofore, ruts have appeared within a few months, necessitating troublesome and expensive repairs. The new blocks have been placed along the edge of the roadway where the rutting



These Paving Blocks, Made of Cast Iron and Filled with Concrete, are being Used on the Roadway of Brooklyn Bridge to Do Away with Wear under the Heavy Team Traffic

was deepest, and although they have been in service for some time, they have not shown indications of wear.

Les. L. Worts, 405 W. 118th St.,
N.Y. City

AUTOMATIC ALARM FOR GARAGE ENTRANCE

An automatic alarm for the protection of pedestrians passing the door of the garage, which is flush with the

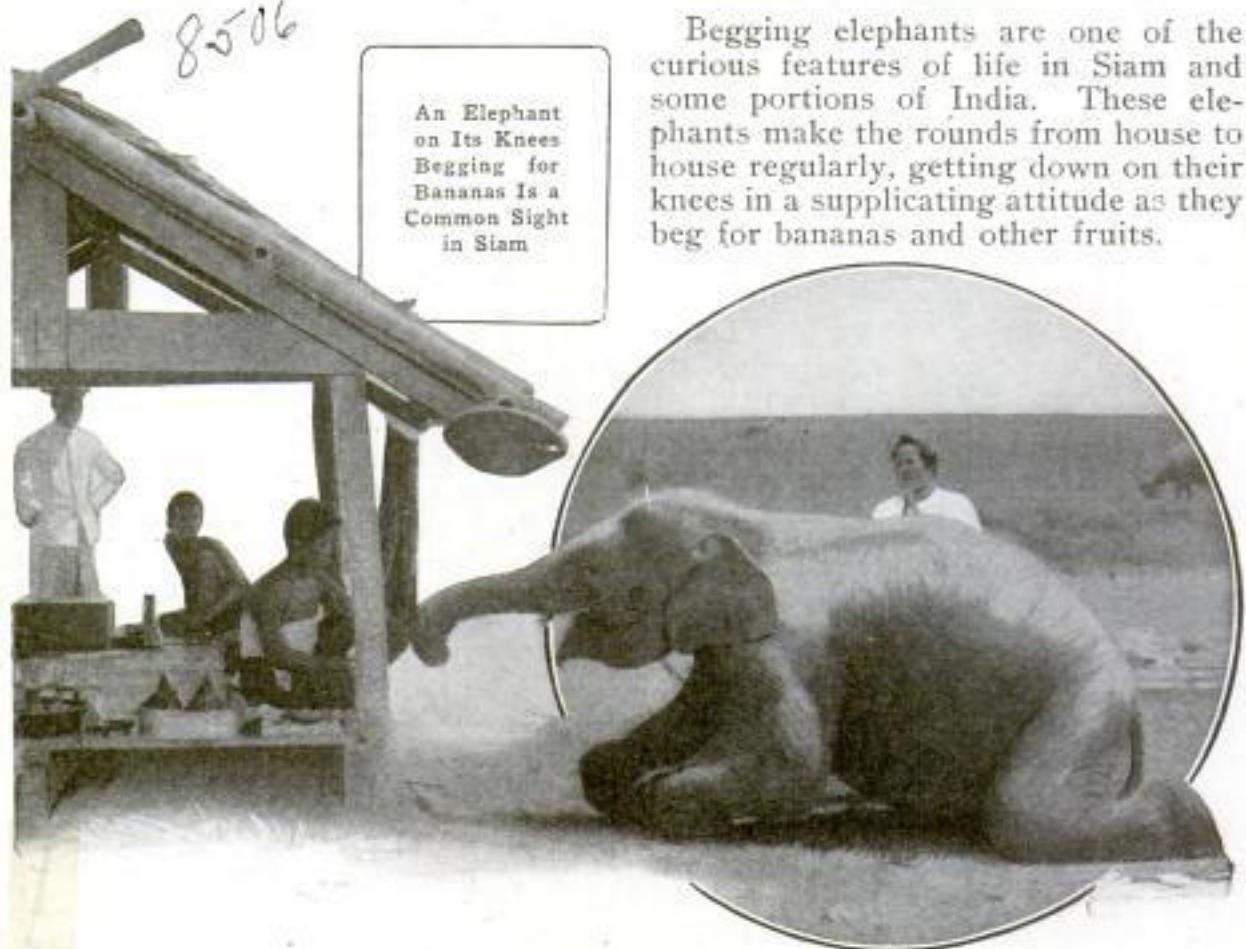


Red Lamp with Automatic Gong Warns Pedestrians When Car is Coming from Garage

inner line of the sidewalk, has been installed by a motor company in Louisville, Ky. The alarm is carried on a bracket that projects out over the sidewalk and consists of a red lamp that is kept burning at all times during the night, with a gong that rings when a car is coming from the garage. The most interesting feature of the apparatus is the automatic device that sounds the alarm. Placed in the floor of the garage in such a position that the two wheels on one side of any car coming from the garage must pass over it is a contact plate that makes and breaks the circuit controlling the gong. This plate is curved upward at the end so that the circuit is open under ordinary conditions, but a car passing over the plate depresses it and makes a contact.

Lord Rosse's telescope, a 6-ft. reflector, for 70 years the largest in the world, has been relegated to a museum.

THE BEGGING ELEPHANTS OF SIAM

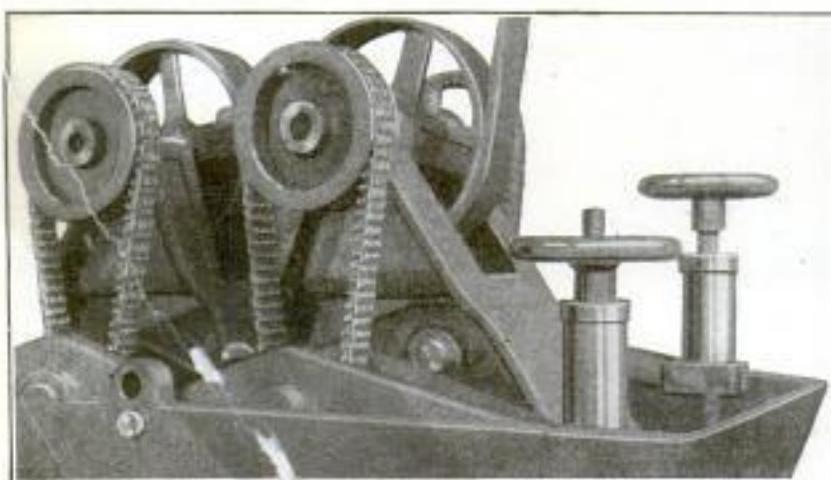


TESTING DRIVING CHAINS FOR HEAVY MACHINERY

8892

Transmission chains which are to be used for heavy work are tested on a

which they are expected to meet in actual service. Obviously any weakness or flaw is quickly discovered in this manner, but another function is also performed. By putting them to a high initial tension in this way the slack is taken out of the bearings, which makes an adjustment after a short period of usage unnecessary. In the accompanying photograph the machine is shown in operation. The two chains in the foreground are being



This Machine Removes the Slack from Chain Bearings and Makes a Second Adjustment Unnecessary

stretching machine which submits them to a greater strain than that

stretched, and this is done by adjustment of the screws at the right.

Chas C. Lynde, P.O. Box 468, Pittsburgh, Pa.

INCENDIARY MEDIUMS USED
8828 BY GERMANS IN WAR

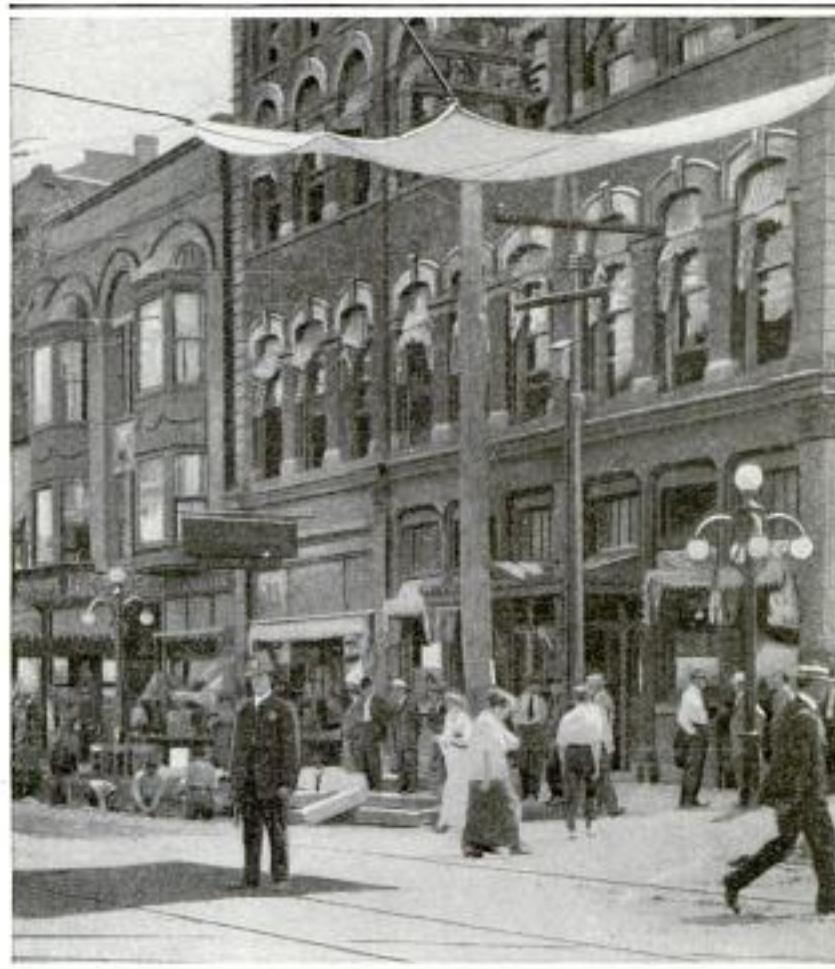
Reports from correspondents in Europe's theaters of war describe some of the equipment with which the German forces are said to have methodically burned villages in Belgium and on the French frontier, and razed buildings standing in the way of their advance. It is claimed that motor tank cars filled with gasoline under pressure have on several occasions been run through the streets of a town, sprinkling the outsides of the houses, which in turn have been fired by means of hand grenades. It is also asserted that in many regiments there is an incendiary corps equipped with gasoline cans, which are strapped to their bodies. These men enter a house which is to be burned and sprinkle the inflammable liquid through its rooms. An American correspondent of standing, in his cable dispatches, has

described the firebrand disks which he asserts are carried by many of the German soldiers in Belgium. These consist of small wads, about the size of five-cent pieces and closely resembling charcoal, which are composed of a nitrocellulose material. They are contained in small bags which, when used, are ignited and thrown through windows of the houses which it is wished to burn. The effect is that each disk burns violently and jumps from one place to another much the same as a firecracker, although the combustion causes no noise, and no trace is left of what caused the fire.

ask Mr. Elliott, Art Dept.
SHIELDING TRAFFIC OFFICER

7915 FROM SUN'S RAYS

An ingenious arrangement for protecting a traffic policeman from the sun's rays during the hot days of sum-



By Changing the Position of This Canvas Shade as the Sun Moves,
a Traffic Policeman may be Afforded a Shady Place to Stand
during the Heat of a Summer Day

mer, without at the same time obstructing the street with a large umbrella and supporting tripod which at certain hours is valueless, is employed at Aurora, Ill. It consists of a large square of canvas held by ropes which are fastened to pulleys on poles at the four corners of the street intersection. By letting out or drawing in the various lines the shade may be moved as the sun travels its course.

The U. S. naval collier "Caesar" was the first ship to proceed direct from Washington, D. C., to San Francisco through the Panama Canal.

Infr: Duddy Tool Co.,
Schenectady, N.Y.
Price \$3.00

744

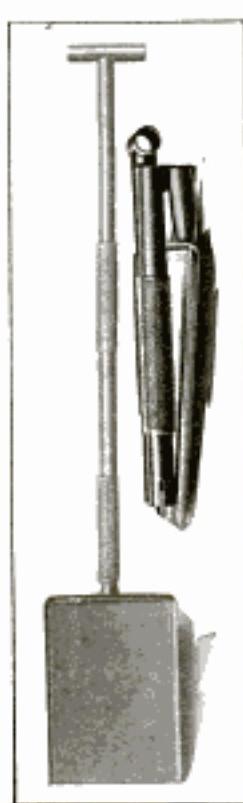
POPULAR MECHANICS

The Rockwood Mfg. Co.,
1902 English Ave.,
Indianapolis, Ind.

FOLDING SHOVEL DESIGNED

9008 FOR MOTOR TOURIST

Intended particularly for the use of motor tourists, a folding shovel has been devised which may be easily carried in a tool box, or under the rear seat. The handle does not unjoint, but when unlocked may be folded back so that the whole implement occupies a space of about 12 by 6 by 2 in. It weighs 4 lb. and is substantial enough for all ordinary work. An additional advantage in having such a tool in the repair kit is found when it is necessary to jack up a car in sand or mud, at which time the shovel may be used as a base for the jack.



NEW BRITISH DIRIGIBLE HAS NOVEL FEATURES

A new type of airship recently patented in England, of which several are being built for the British military authorities, according to report, embodies an attempt to combine the advantages of the rigid or Zeppelin type of dirigible with those of the nonrigid type. In this new air craft, the cigar-shaped outer air-tight covering contains a number of gas bags which, when filled with gas, completely fill the envelope, expanding it to its elastic limit and so rendering the whole structure rigid enough to navigate accurately. As the bags become deflated, through leakage or condensation, air is pumped into the outer envelope, thus maintaining the necessary rigidity. The main advantages claimed are simplicity of construction and ease of transportation when deflated.

FRICTION GEARS OF PAPER TRANSMIT HIGH POWERS

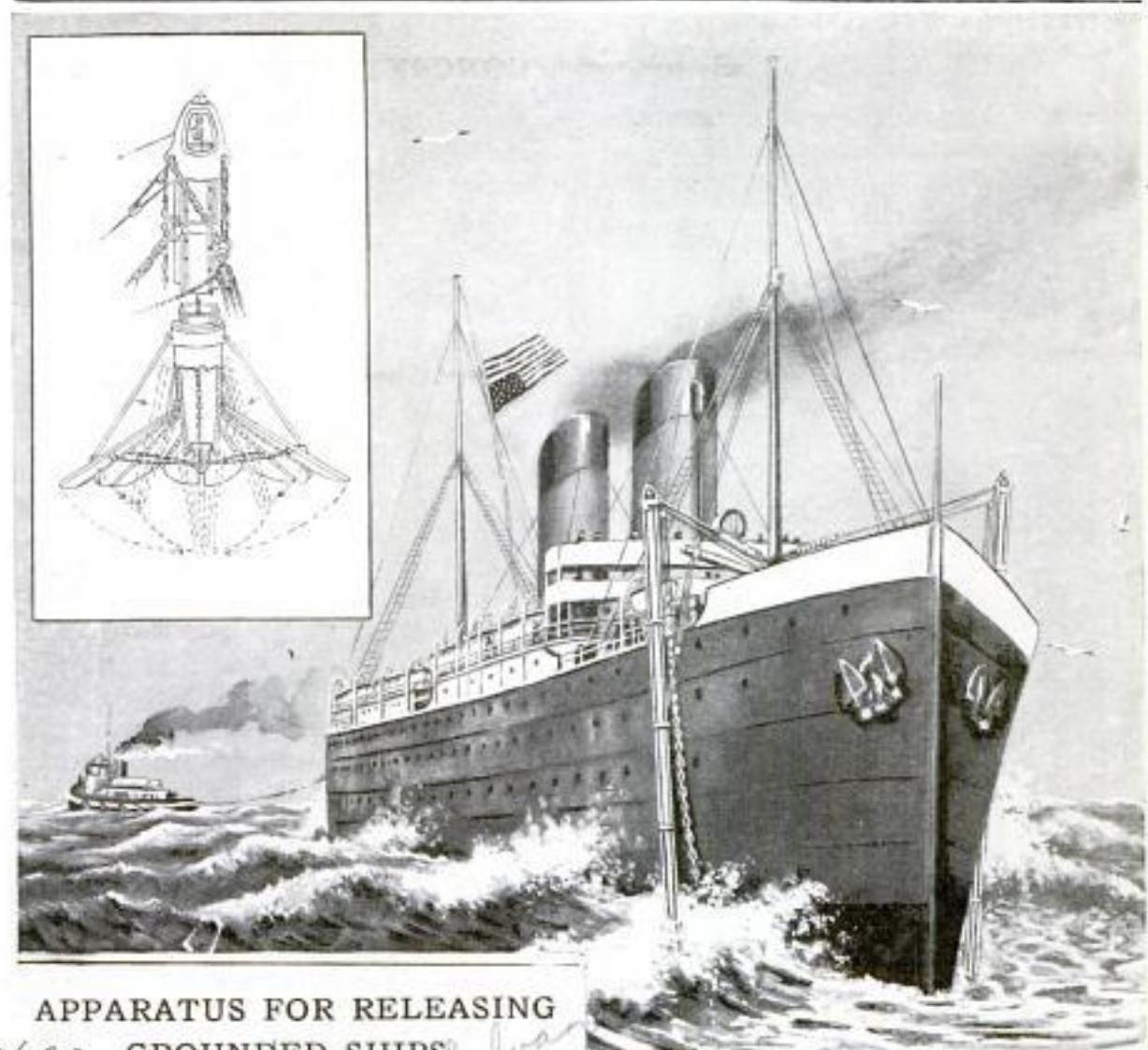
Friction transmissions, in which intermeshing toothed gears are replaced by wheels having faces held in rolling contact by spring pressure and transmitting the load from one to the other by surface adhesion alone, are being made in a wide variety of sizes and forms, for many industrial purposes. Very large horsepowers are transmitted in this way in some installations. A recent development is the use of paper-faced cones operating in connection with iron cones to perform the functions of a bevel gear. The wearing qualities of the paper are said to be excellent, and as high as six horsepower per inch of contact width can be transmitted at a speed of 2,000 revolutions per minute.

PHONOGRAPH HORN SERVES AS FLOWERPOT HOLDER

Using a cast-off phonograph horn as a jardinière is the uncommon service a Californian has made of an article which he redeemed from a scrap heap. The framework to support the funnel is made of strips of iron an inch wide, securely fastened together by rivets. The flower shape of the horn makes it quite a novelty as a container for a blooming plant when used either on a porch or lawn.



C Water proof and fireproof paper and noninflammable motion-picture films made from seaweed have been produced by an English inventor.



APPARATUS FOR RELEASING
8639 GROUNDED SHIPS

A new apparatus for releasing grounded ships makes use of much the same principle as that used by a boatman on a small scale when he poles his boat off a beach. Two tubular steel columns that can be built up in sections to suit any height of ship are placed at the sides of the ship with their bases resting on the sea bottom. The bases of the columns may be spread out like an inverted umbrella for working on soft ground. Chains slung under the hull lead through gears at the top of each column to powerful winches on deck. With the winding up of the chains enough of the weight of the ship can be taken off the bottom to enable the ship to back off or be pulled off by tugs. The apparatus can be taken apart and stored on board the ship.



When the Chain Slung under the Hull is Wound Up by the Winches on Deck, Enough of the Weight of the Ship is Transferred to the Columns to Enable It to Back Off or be Pulled Off by the Tug. The Diagram at the Top Shows How the Column Base can be Spread Out Like an Inverted Umbrella When the Footing Is on Soft Ground

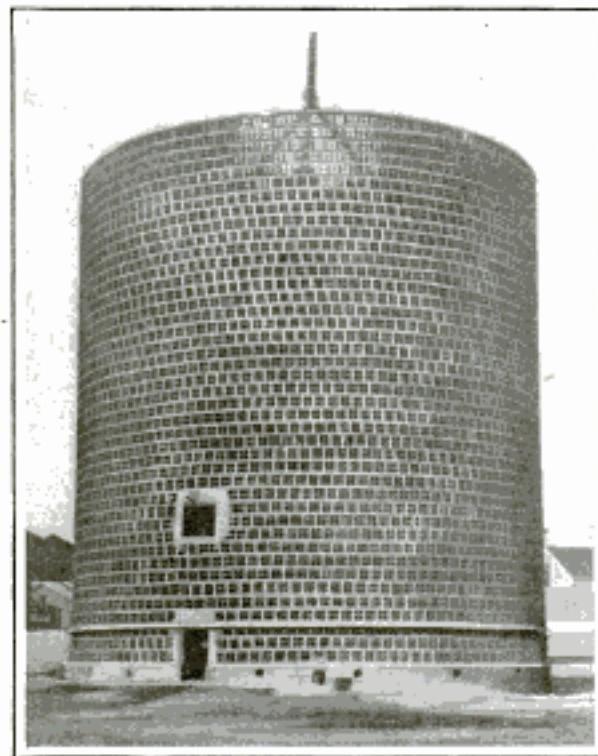
Owned by Farmers Cooperative Elevator Co.,
Rudd, Iowa.

O.R. Beyer, 1429 W. 9th St.
Des Moines, Iowa.

POPULAR MECHANICS

FIREPROOF CRIB IS BUILT 9/10 OF HOLLOW TILE

Built of hollow tile and concrete, a fireproof corncrib, with a capacity of approximately 1,000 bu., has been con-



Corncrib Made of Hollow Tile

structed at Rudd, Iowa. The foundation and flooring of the structure is made of concrete, while the latter is supplied with drain pipes so that any water that might be driven in during a rainstorm would be drained out before it could work any injury to the grain. As a protection against rats and mice, galvanized iron and fine wire screening is used about the bottom of the structure. The tile is laid horizontally so that its open ends are exposed. This provides a honeycombed wall with perfect ventilation. In the center of the crib is an elevator which is used in hoisting the corn to the top, while passing along a pit at the bottom is a belt conveyor for carrying corn to a sheller on the outside.

An appropriation of \$90,000 has been set aside by the state of Massachusetts for the reforestation of the denuded areas of Cape Cod.

Prometheus 8/29/14 METHOD FOR ACID-PROOFING CONCRETE PIPE IS FOUND

8/29 Patent rights have recently been awarded in Germany on a process for rendering concrete pipes acid-proof. The method consists of coating the interior of the tubing with asphalt, a thing which has previously been attempted but not with satisfactory results for the reason that the material could not be made to adhere permanently. In the new process a certain quantity of asphalt is mixed with the concrete before the pipe is molded. When the cast has been made and the tube dried, the interior is sand-blasted so that the particles of asphalt imbedded in the concrete are laid bare. When hot asphalt is subsequently coated over the inner wall of the pipe it immediately combines with the asphalt particles in the concrete, which serve to securely anchor it in place. There has been much demand for tubing of this kind in industries in which large quantities of materials containing acids must be conveyed through pipe lines.

SIX-TON MOTOR TRUCK USED 8/10 IN HANDLING GARBAGE

The problem of transporting garbage in a way to suit the peculiar conditions prevailing in that city has been solved in Detroit by the use of a six-ton motor truck working in conjunction with garbage-collection wagons. Owing to the long haul from most sections of the city to the substation where the garbage is loaded on railroad cars for transport to the reduction plant located outside the city, it is impracticable to use horse-drawn wagons for this part of the work. The motor truck could not be used in the house-to-house collection, owing to loss of time caused by the numerous stops. The solution was a combination of the two means of transportation. Each wagon is equipped with a box that holds two tons of garbage and can be lifted off the running gear. The motor truck has a flat deck and is equipped with a 2½-ton crane.

Frank C. Perkins
Eric Co. Savings Bank Bldg.
Buffalo, N.Y.
Copyrighted material



This Garbage Truck is Equipped with a Two and One-Half Ton Crane with Which the Loaded Boxes are Lifted from the Garbage-Collection Wagons to the Deck of the Truck

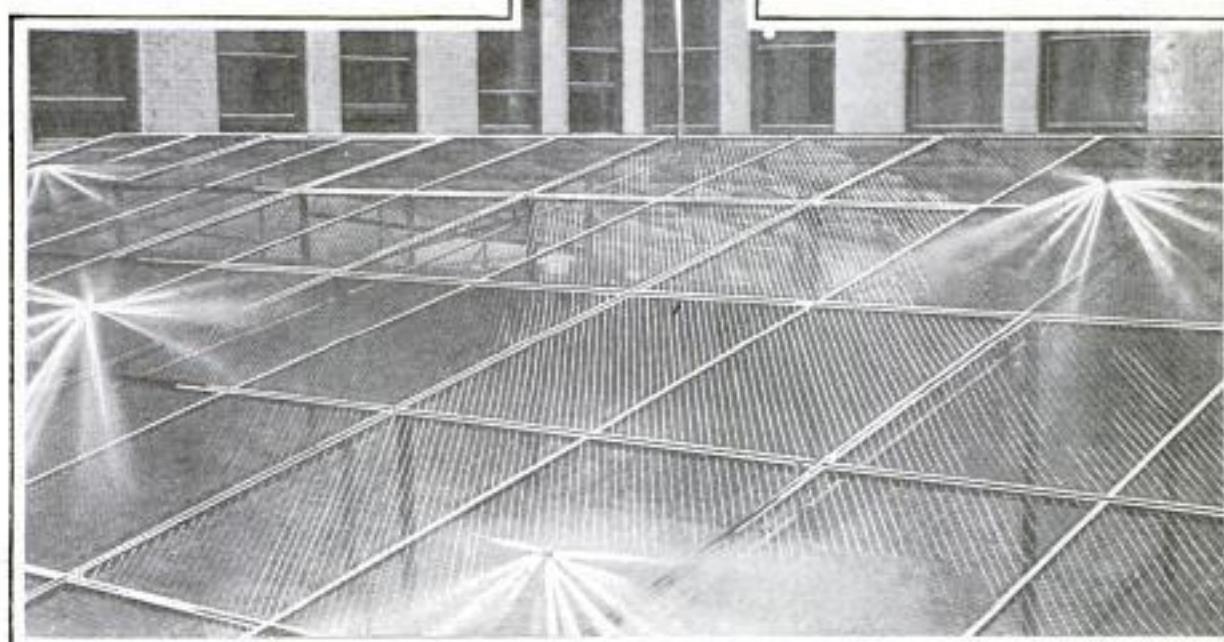
As the truck traverses the route to the substation it is met by the collection wagons, the loaded boxes are lifted to

the deck of the truck, and empty boxes brought back from the substation by the truck are replaced on the wagons.

8277 SPRINKLER SYSTEM FOR COOLING LIGHT COURT

In a high office building in which the glass roof of the central light court is near the third-floor level, a sprinkler system has been installed which keeps the upper side of the skylight wet and not only cools the air on hot days for the tiers of offices above, but prevents the accumulation of dust, which has proved an objectionable feature in the offices facing the court. The water pipes are suspended under the top chords of the steel frame and have vertical

risers that project well above the surface of the skylight, and to the tops of these risers sprinkler nozzles are fixed. One riser, located at the center of the skylight, has an ordinary nozzle that shoots the water upward to a height of 50 or 60 ft., and the effect is that of a fountain in the middle of the court. The water flows from the skylight into drains located at the corners of the court. During the summer the water is turned on frequently.



These Sprinklers Keep the Skylight Wet on Hot Days, Washing the Dust into the Drains and Cooling the Air for the Tiers of Offices Above

J. S. Reid, 506 Belden Ave., Chicago, Ills.

**LARGE GAS-HEATED OVEN
FOR BAKING ENAMELS**

One of the largest gas-heated ovens in the world has just been placed in service at Youngstown, Ohio, for baking the enamel on metal furniture. This oven is 30 ft. long, 16 ft. deep, and 11 ft. 6 in. high, and is divided into three compartments. It is of the radiator type, the chamber containing the gas burners being placed under the floor of the oven and made entirely independent of the baking compartments, so that the gas flame cannot come in contact with the fumes from the enamel as it is baked. The heating chamber, which is built under the entire bottom of the oven, is connected with ducts at the top of the oven by a series of flues that run up the sides of the compartments, and in this way the heat is radiated not only from the floor but from the sides as well. The floor plates are perforated and are supported on castings clear of the heating chamber, so that any material to be baked can be placed on the floor without danger of burning. The three baking compartments can be run independently and at different temperatures if desired, and each is provided with doors at both ends, to facilitate the handling of the material. Support is furnished by uprights that have their footings below the heating chamber.

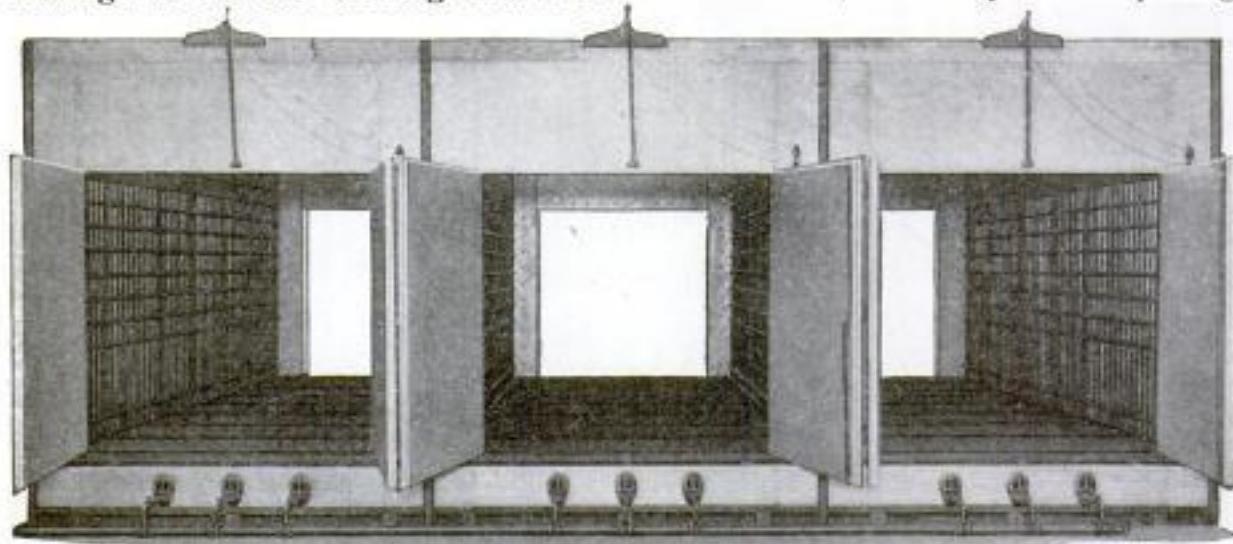
These uprights are hollow and serve to supply the oven with fresh air, which is heated as it passes through the portions of the uprights that are within the heating chamber.

**LANOLIN WATERPROOFING
FOR FRENCH UNIFORMS**

9392 Saturday Evening Post
Lanolin, the fat extracted from wool in the process of cleaning it for manufacture, is being used by the French authorities for waterproofing the clothing of their soldiers in the field. The wool fat is reduced to a liquid by the use of a suitable solvent, such as chloroform or carbon bisulphide, and then diluted with a volatile hydrocarbon, like benzine, naphtha, or gasoline. Garments soaked for a short time in this liquid dry quickly when hung in the open, leaving the fibers impregnated with lanolin and almost perfectly non-absorbent of water. Neither the color nor the fabric is impaired by the treatment.

**ILL LUCK ACCOMPANIES OPEN-
ING OF RAILROAD**

A few days before the opening of a new railroad in northwestern California, a slide came down a mountain slope and not only wrecked a \$10,000 steam shovel, but delayed the opening



This Gas Oven, Which Is 30 Feet Long, 16 Feet Deep, and 11½ Feet High, is Heated by Radiation through the Floor and from the Flues at the Sides of the Compartments

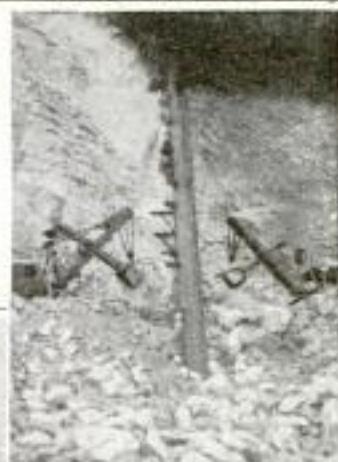
Allen W. Dayton, 1539 Franklin St., San Francisco Cal.



Cutting Away a Giant Redwood Tree That Fell across a New Railroad in Northwestern California

Upper Right: Steam Shovels Clearing Away the Mass of Loose Rock

Lower Right: What was Left of a \$10,000 Steam Shovel After a Slide Came Down a Mountain Slope

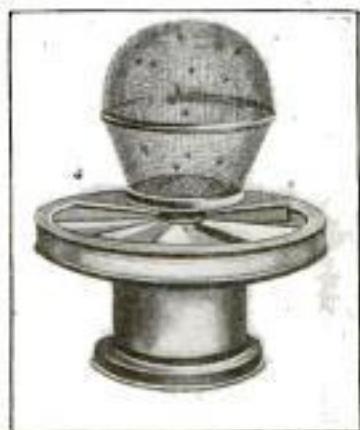


of the line for weeks while two steam shovels were busy clearing away the mass of loose rock. Then at a point where the line passes through a redwood forest, about 40 miles south of Eureka, one of the giant trees fell across the track, and traffic was stopped while a section of the tree was being cut away and the track repaired. The force of the fall was so great that it drove the ties and rails into the gravel roadbed over 3 ft. Some idea of the size of this tree is given in the illustration. It is about 100 ft. from the roots to the point where the tree lies across the track, while the upper branches of the tree are beyond the track and outside the limits of the photograph.

NOVEL DEVICE WHICH TRAPS FLIES MECHANICALLY

8478 An automatic flytrap has been devised which makes use of the tendency characteristic of this insect to seek light when partly enveloped in darkness. The apparatus consists of a fine-meshed screen globe supported above a

revolving bait tray which is mounted above a cylindrical base containing a clockwork mechanism that operates it. Only one-half of the rotating disk, which is provided with a number of depressions in which powdered sugar is placed to attract the flies, is exposed to the light, one side of it being covered. As a fly alights in one of these divisions of the tray it is carried slowly around to the covered side where it is practically in darkness. The only means of immediate exit is through a small aperture which leads to the interior of the wire ball. The fly instinctively travels toward the light admitted through this orifice and enters the trap. One winding of the clockwork operates the trap for 24 hours.



*U. S. Manufacturers Distributing Co., Inc.,
51 East 42d St., N. Y. City.*

Mrs. Avis Gordon Vestal, 4243 N. Kostner Ave. Chicago, Ill.

The Electrical Review 1-8-15

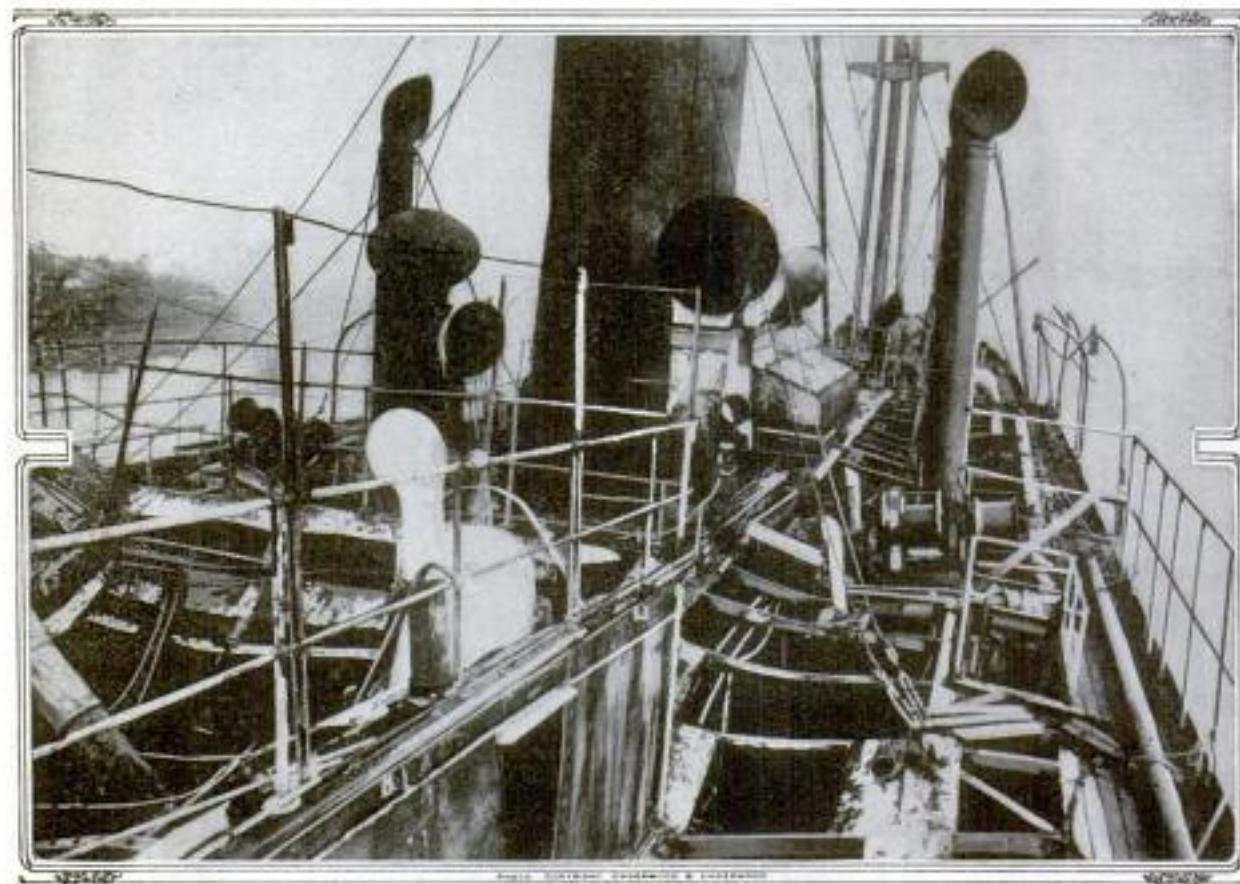
NEW METHODS OF LOCATING AND REMOVING BULLETS

921 Some interesting methods of locating and extracting bullets have been brought to light in connection with the European war. One of the most ingenious of these is that of locating a bullet with the telephone. In applying this method one terminal is attached to a moistened electrode which is applied to the patient's skin, while the other terminal is attached to the probe, or forceps. When the probe touches the bullet a voltaic cell is formed and a grating sound is heard in the telephone, revealing the exact depth at which the bullet is imbedded in the flesh. A method more commonly used is one in which X-ray photographs are taken. Two photographs are taken from different positions and the intersection of the axes of the two views is sufficient for giving the location of the bullet accurately. In the French field hospitals

bullets are being extracted by means of electromagnets, the German bullets with their nickel-steel jackets lending themselves readily to this method of extraction.

HOW A BIG SHIP LOOKS AFTER A FIRE

8570 It is not often there is enough left of a burned ship to photograph, but the accompanying illustration shows how a great steel freighter looks after a disastrous fire. The "Santa Catalina," which was destroyed by flames in the Columbia River, was one of the first ships to carry a cargo from an Atlantic port through the Panama Canal. The freight on board was worth \$400,000 and was almost a total loss, while the vessel itself, worth \$700,000, was very badly damaged. The "Santa Catalina" was an oil burner, and several thousand barrels of crude oil from the starboard tank added fuel to the flames. All the 42 members of the crew escaped.

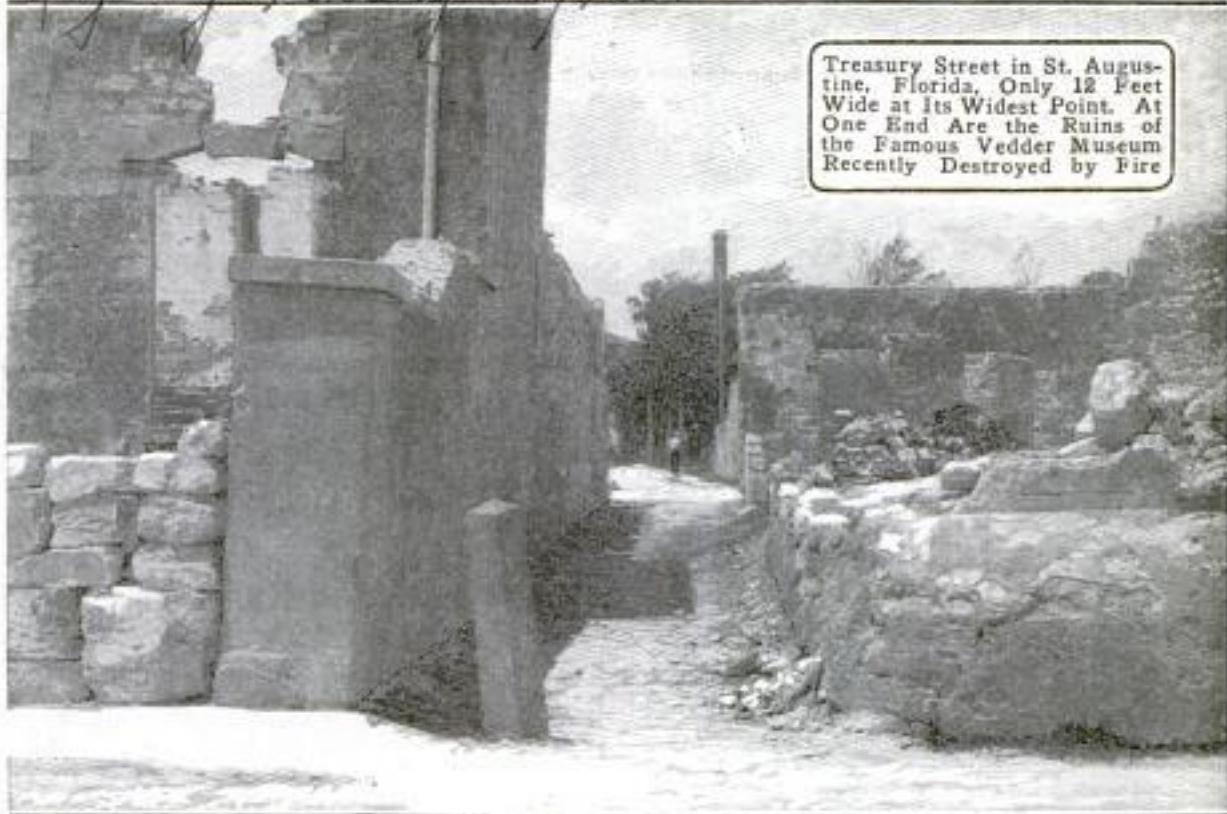


How the "Santa Catalina" Looked after a Disastrous Fire

Underwood & Co.
12-14 West 37th St.,

n.y. City Copyrighted material

Ray Pugh, Celery City, Fla.



Treasury Street in St. Augustine, Florida, Only 12 Feet Wide at Its Widest Point. At One End Are the Ruins of the Famous Vedder Museum Recently Destroyed by Fire

IMPORTANT STREET NO WIDER THAN AN ALLEY

What is believed to be the narrowest street in the United States is Treasury Street in St. Augustine, Fla. This street is two and a half blocks long. It is 12 ft. wide at the west end, but narrows at the east end to an alley across which two persons may clasp hands. This thoroughfare is lighted as well as the "regular" streets in the city. Many front doors open on it, and it has its overhanging balconies, high garden walls, and passing crowds. At one end stood the famous Vedder Museum, recently destroyed by fire.

FRESH-AIR CHUTE DESIGNED FOR SLEEPING CHAMBER

For those who are desirous of having the benefit of an open window in their bed chamber without the accompanying cold during winter months, an ingenious air chute has been perfected. It consists of a collapsible pipe which is made by stretching canvas, or some other durable cloth, over a framework

composed of wire hoops. One end of this tube is fastened over a circular opening cut in a board which fits between the sash and sill of a raised window, while the other forms a sort of drapery which incloses the sleeper's pillow. A cord extending from the bed to the intake at the mouth of the chute permits control over the volume of air admitted.



Novel Method of Obtaining Fresh Air without Making the Bed Chamber Uncomfortably Cold during Winter Weather

Mfr: The Sanitarium Equipment Co., Battle Creek, Mich.

Hinton Gilmore, Battle Creek, Mich.

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Park Row Station Chicago.
Story obtained by J. E. Murphy
Dec. 31, 1904

752

POPULAR MECHANICS

LOCOMOTIVES SUPPLY HEAT FOR PASSENGER STATION

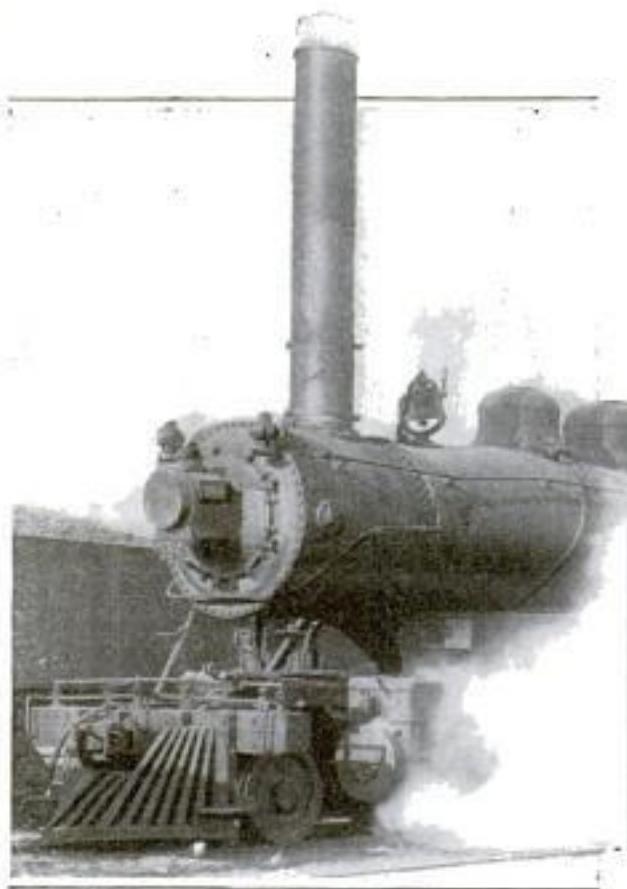
Four locomotives set off on a side-track and connected with the steam main were used by a railroad in Chicago to supply heat for its passenger station and coach yard for a month or more during midwinter, while the boilers in the central heating plant were being replaced. The tenders were first removed, and the locomotives were backed up together in pairs, a space of about 10 ft. being left between the locomotives of each pair. This space was then filled with a platform and shelter for the firemen. Steam was taken from each of the locomotives through a 3-in. pipe, and all four of these pipes were connected with a 6-in. pipe, which led underground to a connection with the permanent steam main. To provide the necessary draft to take the place of that caused by the exhaust from the cylinders when a locomotive is run-

Die Umschau 8/1/14
ning, the smokestacks of these locomotives were replaced by straight stacks, from 8 to 10 ft. in height.

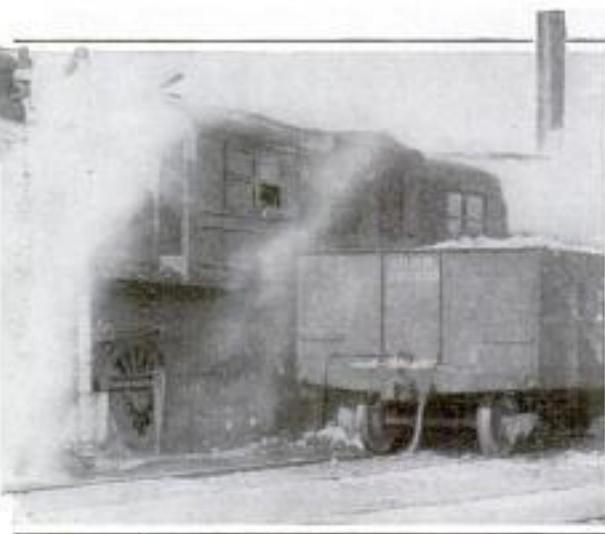
GOLDFISH REVIVES RAPIDLY AFTER LIQUID-AIR BATH

Organic matter is made more brittle than glass when it is immersed in liquid air, which is responsible for the fact that if a human hand, for instance, were placed in the fluid and left there for several minutes it would upon withdrawal be so fragile that a comparatively light impact would crush it into small particles. A severe "burn" caused by liquid air frequently requires months for healing. In view of these facts it is interesting to note the result attained during an experiment in which a goldfish was placed in a tumbler filled with the liquid. It was frozen hard immediately upon immersion and was later removed and placed in a glass of water, the temperature of which was about the same as that of the atmosphere in a comfortably heated room. After a few seconds the fish showed indications of life and shortly commenced swimming around as lively as if nothing had happened.

Using sawdust from a near-by sawmill to make producer gas, a Swedish electric station produces power at half the cost of water power.



Locomotive Supplying Steam for Heating Chicago Passenger Station While Regular Heating Plant was being Repaired



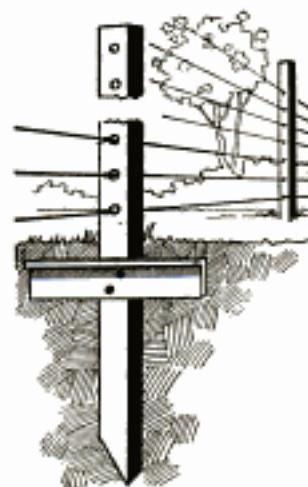
The Keystone 12/1/14

TIME DIFFERENCE BETWEEN
8908 WASHINGTON AND PARIS

The first direct observations for determining the difference in time, and therefore in longitude, between Washington, D. C., and Paris, France, were recently completed and give this difference as being 5 hours 17 minutes 36 seconds. Independent observations were made by the United States and French governments, each having two parties, one at the Arlington naval station and the other at the Eiffel tower. The distance between the two points on a great circle was found to be 3,831 miles. One interesting feature of the observations was that of determining the velocity of transmission of wireless signals, which was found to be about 175,000 miles a second:

7208 GROUND BAR MAKES STEEL
FENCE POST RIGID

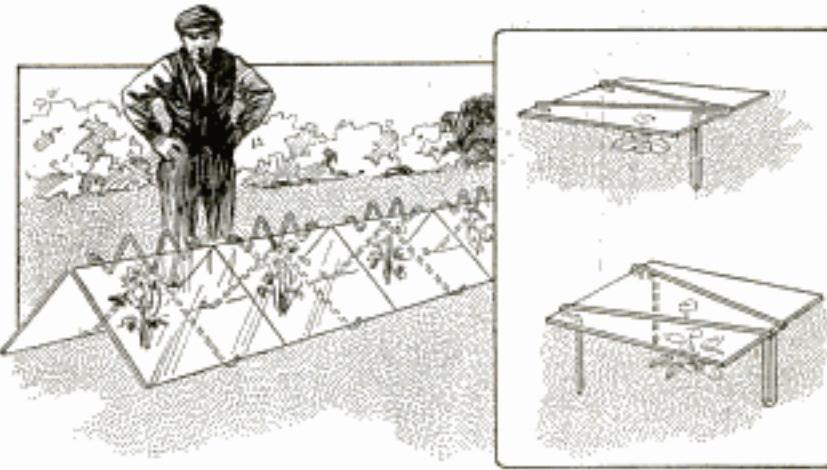
Steel fence posts fitted with bar bases, which hold the upright firmly in the earth, are a recent product. An angle head, which allows the post to be driven with an ordinary sledge, saves the time and cost of digging holes and doing the customary tamping. The ground bar has an 8-in. bearing on the soil, and when sunk below the surface, braces the post, which is set 20 in. deep, against side pressure. Any style of fencing may be attached to the posts without difficulty.



Janesville Barb Wire Co.,
Janesville, Wis.

COLLAPSIBLE GLASS ROOFING
PROTECTS GARDEN PLANTS

Furnishing a shelter for tender plants, protecting them from frost,



Tent-Shaped Glass Roofing for the Protection of Rows of Young Plants

driving rains, and overexposure during the early weeks of spring, a collapsible glass covering is being made in England. It is so arranged that it may be taken apart readily and stored in a small space when not in use. Each unit is composed of panes of glass, held together firmly like a tent by wire fasteners. These are placed end to end over a row of plants, both protecting them and centering the sun's rays upon them. This enables a garden to be set out much earlier than otherwise would be advisable, and insures an early crop.

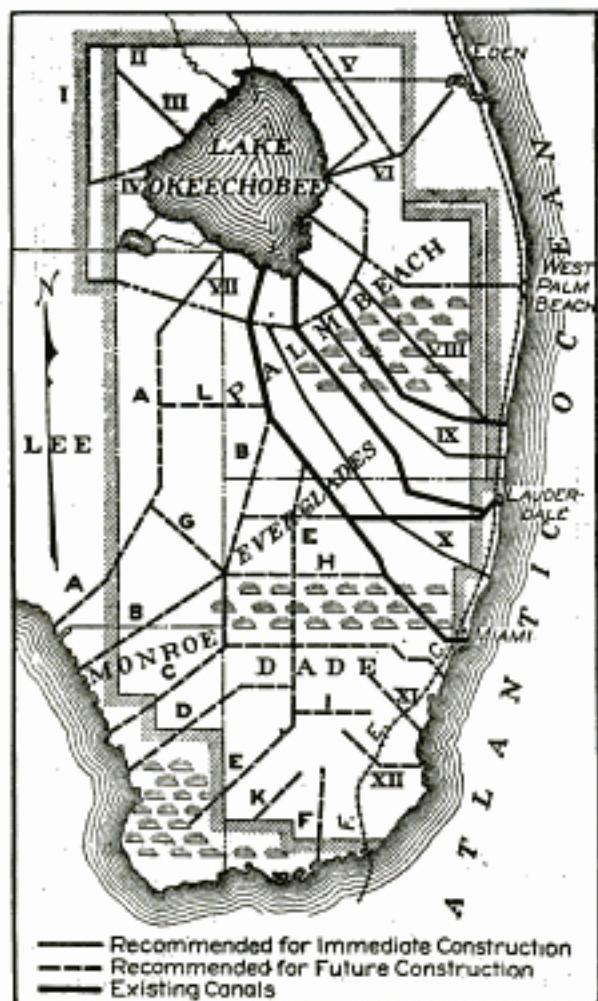
6470 EVERGLADES RECLAMATION A BIG PROJECT

The Everglades, those famous swamps of Florida, covering thousands of square miles in a state adapted by climate to the production of luscious fruits and early vegetables, have represented for centuries a direct loss. Careful scientific investigations have demonstrated that water flowing over the edge of Lake Okeechobee seeks an outlet through the low-lying lands between the lake and the sea. Control of the overflow, it is asserted by the engineering commission recently appointed to report on condi-

Engineering & Contracting
1/28/14

now sold in America: The Glove Co.,
13, Hindemith St., N.Y. City

tions there, will eliminate the swamps. Existing canals are to be supplemented by a system which shall divert the water from Lake Okeechobee



Canals Which are Planned to Make Fertile a Great Tract

through the shortest practical route to the Atlantic Ocean. Included in the project is a navigable canal, 12 ft. in depth, from St. Lucie to the lake, and the construction and utilization of waterpower of 5,000 hp. The total cost of the project is estimated in excess of \$18,000,000.

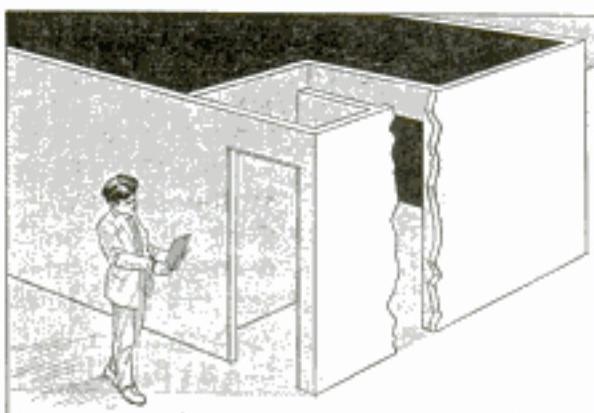
PROLONGING LIFE OF WOOD IRRIGATION PIPES

Millions of dollars have been expended in the United States during recent years in the construction of wooden pipes for irrigation purposes, and this has led the Department of Agriculture to study the question of

how they may best be maintained in order to give the greatest number of years of service. It has been found that conduits made of fir or redwood, if fully exposed to the atmosphere and supported free from contact with soil, will, when properly cared for, last approximately 20 years. Contrary to former beliefs, the life of such a pipe depends upon the wood rather than its metal bands. The growth of fungi and possibly the presence of certain bacteria are principally responsible for decay. Fungi grow only under a favorable combination of air, moisture, and heat; the exclusion of any one of which checks the development. Because of this, pipes which are buried in the ground will be preserved longest by either the maintenance of a high internal pressure which saturates the pores of the wood, or by being packed in very fine soil. When under light pressure and in contact with the earth a wood pipe is most prone to deteriorate, while, on the other hand, if it is entirely exposed to the atmosphere its exterior is generally too dry to be conducive to the growth of fungus spores.

DOORS NOT NEEDED IN DARK ROOMS WITH LIGHT LOCKS

In the construction of laboratories for one of the film companies at Chicago, light locks were devised which eliminate the necessity of employing



The Arrangement of the Light Locks Which Make Doors Unnecessary in Dark-Room Laboratories

either revolving or swinging doors between the dark rooms and those which are illuminated, while at the same time

*Submitted by James L. Woolson
A.M.D. McGraw-Hill Advt. Agency
35 S. Dearborn St., Chicago Ill.
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*Information sheet sent out
by Dept. of Agriculture*

permitting full ventilation. At all the exits the walls are built so that there is a "U"-shaped recess into which another wall protrudes part way, almost the same as if the standard of the letter "T" were partly inserted in the opening of the letter "U," the cross part of the "T" and one side of the "U" representing the regular building walls, and the other parts, the light lock. The surfaces of the lock walls are painted jet-black, to safeguard against reflection. The arrangement is such that while it is possible for a person to walk through the opening without any difficulty, it is not possible for rays of light to penetrate from one room to the next.

Pennell Spee
**NEW LENSES GIVE CLEAR
VISION AT ANY ANGLE**

Although developed apparently to the highest point of perfection the best of spectacle lenses heretofore in use have provided the correct refraction only at or near the optical center, or the point directly in front of the pupil

0°	BR	BR	BR	BR	BR	BR
30°	BR	██████	██████	BR	BR	BR

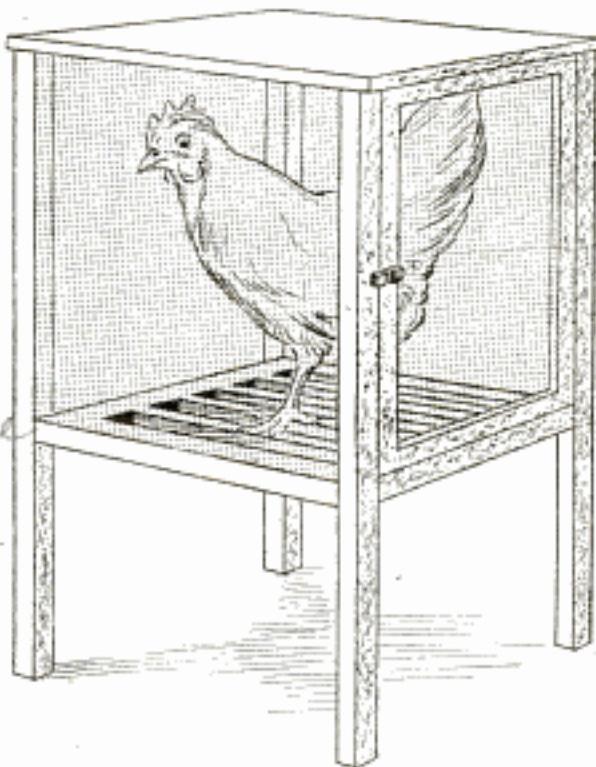
The First Three Columns Show the Distortion Caused at Different Angles by Ordinary Spectacle Lenses, and the Last Three Columns the Effect Produced by Lenses of the New Type

of the eye, and have been subject to a slight distortion when looked through at points near the edge. A new type of lens is designed to do away with this fault and to make the vision as clear through points as much as 30° from the optical center as through the optical center itself. This is accomplished through an exceedingly complex method of grinding the lenses, that necessarily makes them expensive.

**DEVICE DISCOURAGES HENS
FROM SITTING**

A device which has been used with some degree of success in discouraging hens from sitting, consists of a screened coop provided with a bottom made of narrow slats which are quite widely

separated. When placed inside of this, a hen finds standing the most comfortable position it can assume. If it at-



If Placed in This Coop for a Day or Two, a Hen Usually Returns to Egg Laying

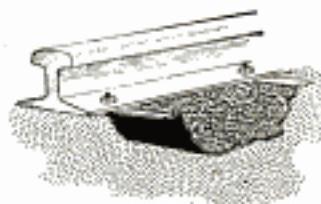
tempts to sit, the position is difficult to maintain, and the sensation of feeling air currents instead of eggs, disconcerting. After having been kept in this box for two or three days a hen usually returns to laying eggs.

**STEEL TIE DESIGNED TO BE
ELASTIC**

A steel railroad tie brought out by a German inventor is an attempt to combine the advantages of metal with the elasticity of the wooden tie. This tie consists of a steel trough having curved sides and bottom, so

that while it has a firm bearing in the roadbed it will yield slightly under the weight of a train. It is attached to the rail by bolts passing through the projecting edges, and is filled with earth or gravel.

Gromthaus 5/9/14
Inventor: Edward Ohler
Copyrighted material



NOVEL AND PRACTICAL THINGS FOR DAILY USE



Convenient Gas-Lighting Device

which eliminates the necessity of using matches when lighting a gas stove or lamp. Inside of a perforated cap, which is at the end of a wooden handle, are several fine wires made of a metal which becomes incandescent when coming in contact with the gas. Because of this property it is only necessary to turn on the gas and place the stick in the flow in order to ignite it.

An ingenious memorandum slip which serves a real purpose for the man who has a tendency to be forgetful, consists of a small piece of celluloid fitted with a clip that may be fastened to the stem of a watch. Notes may be scribbled in pencil on the celluloid and erased at will, while anything written on the tab is sure to be noticed during the day whenever the watch is consulted.

Designed for warming a small quantity of water or milk quickly, an electric heating device has been invented which may be used in a nursery or sick room. The resistance coil is incased



Electrical Water Heater

in a cylinder less than an inch in diameter and about $4\frac{1}{2}$ in. long. This is provided with a metal top which serves as a cover for the glass in which the liquid to be heated is contained. It is said to be capable of boiling a glass of water in less than two minutes.



Letter Opener and Paper Cutter

inclosures are not so liable to be cut in two accidentally as when an ordinary paper knife is used. It is fitted with a keen cutting edge which may be removed when desired.



Hot-Water-Bottle Dolls

ers which may be readily filled, making the bodies of the dolls plump, soft, and warm so that they are eagerly accepted as bedfellows. They are made either with indestructible heads, or like rag dolls.

An adjustable clamp for a crochet needle has been devised which enables

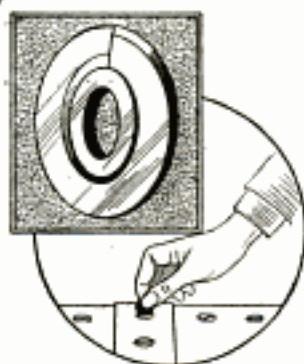


Finger Clamp on Crochet Needle

it to be fastened to the first finger so as to relieve the strain of gripping the instrument between the thumb and finger. The device also assists the beginner in learning the correct way to hold a needle, which is not always as easy as it looks.

Intended for emergency purposes, a pocket screwdriver is being made which may be carried as easily as a small coin. The device is about the size of a quarter and is provided with a tapering rim so that it will fit any ordinary-sized screw slot snugly. It is also supplied with a center hole which enables it to be carried on a key ring or hung on a nail.

An enamel-topped kitchen table which is easily kept clean and sanitary is a recently introduced household accessory. The top is made of a white, reinforced material that is not only water and acid-proof, but also is resili-



Convenient Pocket Screwdriver



Enamel-Top Kitchen Table

ent enough to eliminate the danger of chipping china by contact with it. It is provided with a seat which may be swung out of the way when not in use.

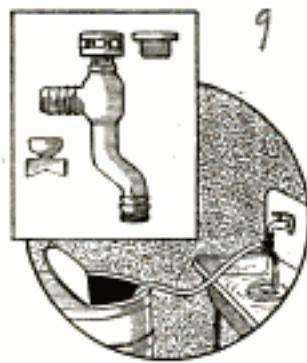
A convenient water-draining device, for use in private laundries and similar places, is designed to transfer water from a

washing machine, or other receptacle, into a sink, or wherever it is wished to conduct it. The apparatus is attached to a faucet, and has a hose connected with a side extension and reaching into the container which is to be emptied. By turning on the water a suction is created in the hose, causing the water to discharge itself.

A bottle stopper which hermetically seals a flask and eliminates the danger of a cork becoming loose, allowing the contents of a receptacle to spill in a bag or suitcase, is designed particularly for the use of travelers. It is fitted with a heavy rubber tube which may be turned down over the lip of a bottle, sealing it air-tight and at the same time holding the cork securely in place.

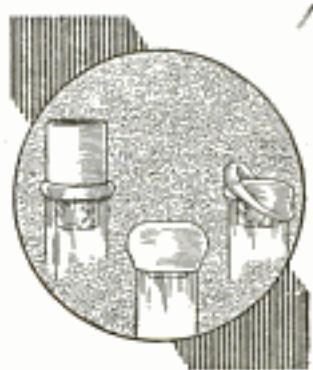
To eliminate the danger of the polished top of a bureau or desk being marred when plate glass is used to cover it, triangular rubber pads are being made which, when placed under the glass at each of its corners, prevent it from slipping.

Flat, telescoping curtain rods are being made which, although light in weight, have sufficient strength to support heavy valances, or over draperies, without sagging.



Water-Draining Apparatus

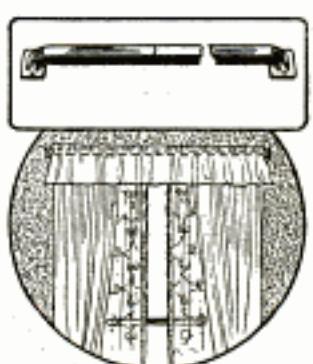
private laundries and similar places, is designed to transfer water from a



Stopper Seals Flask Hermetically



Rubber Pads for Glass Table Covers



Curtain Rod Which does Not Sag

Engr: Thomas E. Chapman
2217 Webster Ave.,
Pittsburgh, Pa.

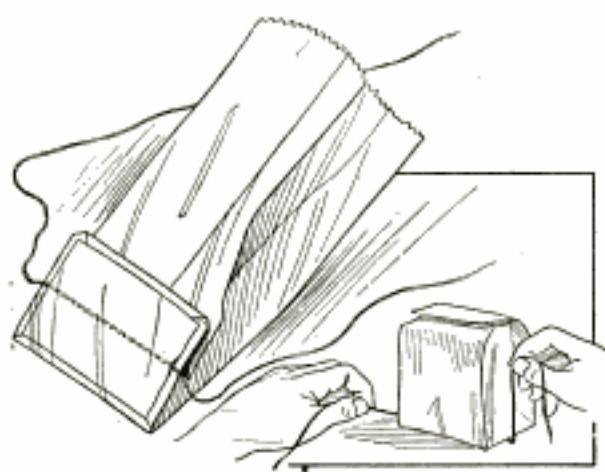
758

POPULAR MECHANICS

Engr: Sturges & Burn Ings. Co.,
5008 So. Green St.,
Chicago, Ills.

PAPER SACK HAS STRING 7898 ATTACHED READY TO TIE

A paper bag carrying, fastened between its folds, a string with which it may be tied, is a recent novelty de-



Paper Bag with String Attached

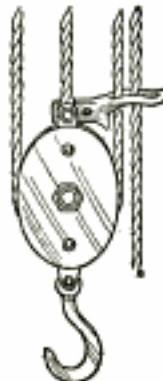
signed to facilitate the wrapping of small packages. Ends of the string extend through channels at both sides of the bottom of the sack. A sufficient length of twine to securely tie the package is contained in a compact space between the folds. When the bag is filled and ready to be wrapped it is only necessary to pull the string about the bag and fasten it.

SAFETY DEVICE TO HOLD 7015 SUSPENDED PLATFORM

A large percentage of the accidents that happen to painters and other workmen working on platforms that are sus-



How the Safety Device Works
in Case a Workman Loses
His Hold on the Fall Rope



pended by block and tackle occur when the fall rope slips from the hands of one of the workers, and to prevent just such accidents as this a simple and apparently effective device has been invented. It consists of

Edmond A. Von Raenel
312 Wendell St.,
Inventor Chicago, Ills.

a steel loop with a solid end through which the bolt at the top of the block passes, forming a pivoted connection, with the loop end free to swing up or down. The fall rope and the adjacent rope pass through the loop. At the inner end the loop is large enough to permit the ropes to work freely, but tapers to a tight fit at the outer end. In case a workman loses his hold on the fall rope, the friction of the rope causes the loop to fly upward, when the fall rope is forced into the small end of the loop and holds the platform securely.

A REFRIGERATOR MILK CAN 7197 KEEPS MILK SWEET

A new way of shipping milk and cream for long distances during the heated season is offered by the invention of a refrigerator milk can



which is simply two cans, one within the other, the space between being filled with baked cork and hair felt. In severe tests, under practical road conditions, milk shipped in these cans showed a rise in temperature of but 18° in 24 hours, when exposed to a continuous temperature of 92°. A special form of neck is provided, the inner portion being a segment of a sphere over which the bowl of the cover fits closely, so that the can is perfectly tight, even if the cover be tilted to one side or the other.

MILITARY FLIERS' SUCCESS 7148 HINGES ON AIR MAPS

In extensive operations an airman is almost as seriously hampered if he attempts to navigate the air without aeronautical charts, a compass and a barometer, as a seaman would be were he to try to sail the ocean without nautical maps and various instruments

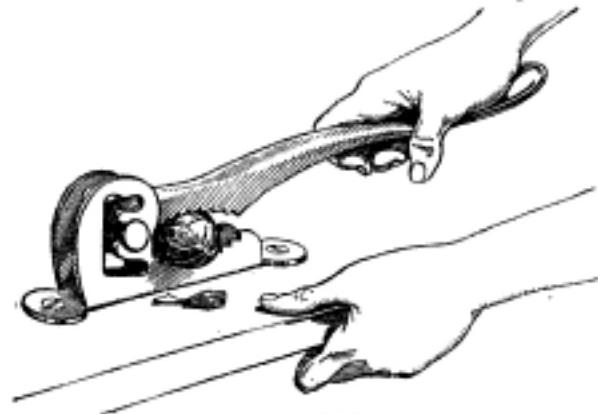
Flying

with which to make observations. This is especially true of the military flier who is penetrating into foreign territory. He must know his position accurately, for a forced landing might mean his undoing. And to the aerial chart is due much of the success of European military airmen. This is mounted on rollers, most often, and so arranged in a frame that an aerial navigator may unwind his chart and thus keep a map of the immediate territory over which he is flying constantly before him. When made for military purposes such a chart includes the positions of fortifications, military camps and whatever information is known of the enemy's district. By landmarks indicated on the map he is able to recognize his position. Attached to the frame usually are his compass, barometer and clock, although these oftentimes are provided for in some other manner.

GRIP STRENGTH NOT NEEDED

7106 TO WORK NEW NUTCRACKER

A new type of nutcracker is worked by placing pressure upon a single lever, instead of gripping two bars as in the case of the ordinary implement. The construction is simple, the device consisting of one lever pivoted into a shorter toothed bar which forms the lower part of the cracker. When in use the instrument is placed on a table, the nut inserted between the two pieces



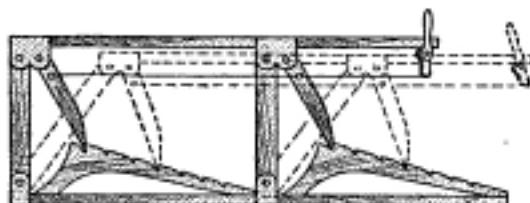
Nutcracker a Child can Use.

and pressure exerted upon the lever. In this manner it may be worked with rapidity by a child.

Inventor: G. H. McEwan
Swift Current,
Sask., Can.

ADJUSTABLE SEAT FOR 7171 MOTOR CHAUFFEUR

While the necessity of an adjustable automobile seat suited for quick adaptation to different drivers long



This Automobile Seat
Is Adjustable to
Suit the Driver

has been felt, the invention of such a device has been made only recently

by an Australian. In the case of an ordinary fixed seat, the reach to the clutch and brakes may be comfortable for one chauffeur and exceedingly awkward for another. To overcome this trouble, a frame has been made which may be adjusted speedily to any desired position by moving the seat downward and forward, or upward and backward. This function of the arrangement is made possible by the operation of a single lever. To do this, a series of ratchet bars are employed which are fastened to the seat by link rods. Pivoted to these are locking members which engage and disengage the ratchets.

NEW PROCESS CHEAPENS

9502 RADIUM COST

Radium bromide valued at \$11,000, recently turned over to the National Radium Institute for the treatment of cancer cases, is the first radium extracted by the new process developed by the experts of the Bureau of Mines. The work of extracting the metal was done in the laboratory of the bureau at Denver, from Colorado ores. The cost was only \$40,000 a gram (15.43 grains), while the commercial price of radium is about \$120,000 a gram.

Dispatch from Washington in Chicago newspaper and investigated by J. E. McCarthy, Col. Inst., Wash. D.C.

NEW UNITED STATES COAST GUARD ESTABLISHED

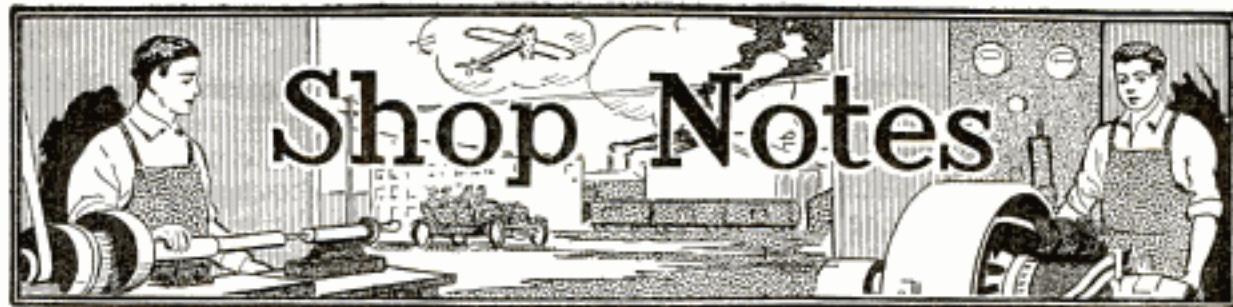
The establishment of the United States Coast Guard, provided for in a recent act of Congress that has been approved by the President, brings about an amalgamation of the revenue-cutter and life-saving services that is expected to result not only in an improvement in the work of these two services but in the provision of an invaluable means of coast patrol and defense in time of war. The coast guard is to have its land and sea forces enrolled like soldiers and sailors, under like discipline, and with parallel emoluments for service and rewards for distinguished deeds, but organized primarily for the saving of human life and property.

At the discretion of the President, the entire service may be transferred to the Navy Department, and will constitute a naval reserve composed of highly trained officers and men thoroughly familiar with the coast and ready at a moment's notice to operate under the Navy Department. In time of war the life-saving branch, now designated as the shore division of the new service, would serve as a beach patrol to give warning of the approach of hostile vessels. The life-saving stations would be used for observation and signaling, while the revenue-cutter branch, now designated as the marine division, would be utilized for scouting and similar duties. The plan of using the life-savers as a coast patrol in time of war is not a new one, and was resorted to during the Spanish-American War. The amalgamation of the two services has created an establishment composed of 4,100 officers and men, 25 ships of the seagoing type, 19 harbor tugs and launches, and 279 coast-guard stations.

Under the regulations, the disadvantages that have heretofore operated to make the life-saving and revenue-cutter services unattractive to ambitious young men have been removed. Provision is made for placing the men on the retired list for age, or after 30

years of service, as is done in the army and navy; for increased pay for reënlistment; for clothing allowances; for medical attention from the United States Public Health Service, and for a sum of money equivalent to two years' pay to the dependents of men who lose their lives in the service. With all the benefits that are expected to accrue from work of the coast guard, it will, in fact, cost the country nothing, as the saving of life and property will at all times be worth more to the people than the cost of maintaining the service. Records of the two services, for the year ended June 30, 1914, show that for each dollar expended there was a saving of \$5.09 worth of property from the perils of the sea. In addition to this, 5,238 lives were saved and 31 derelicts, or obstructions to navigation, were removed or destroyed, during this period, while assistance was rendered to 2,147 vessels having an aggregate value, including cargo, of \$24,386,191. There will be an increase in the cost of operating the service, however, due to the retirement of officers and men and reënlistment and disability increases, all estimated at \$400,000 for the first year, and the payments made to dependents of men who lose their lives in the service, estimated at \$20,000 a year. One of the men to be placed on the retired list at three-quarters pay is Sumner I. Kimball, now 80 years of age, who founded the life-saving service and was its superintendent for many years, and who devoted the best years of his life to its upbuilding. While the work of the coast guard will be confined mainly to the Atlantic, Pacific, and Gulf coasts and to the Great Lakes, the service will be held in readiness to give prompt assistance when lives and property are threatened by floods along the rivers of the country.

©In one day 15 forest fires in California were started by a single wood-burning locomotive.



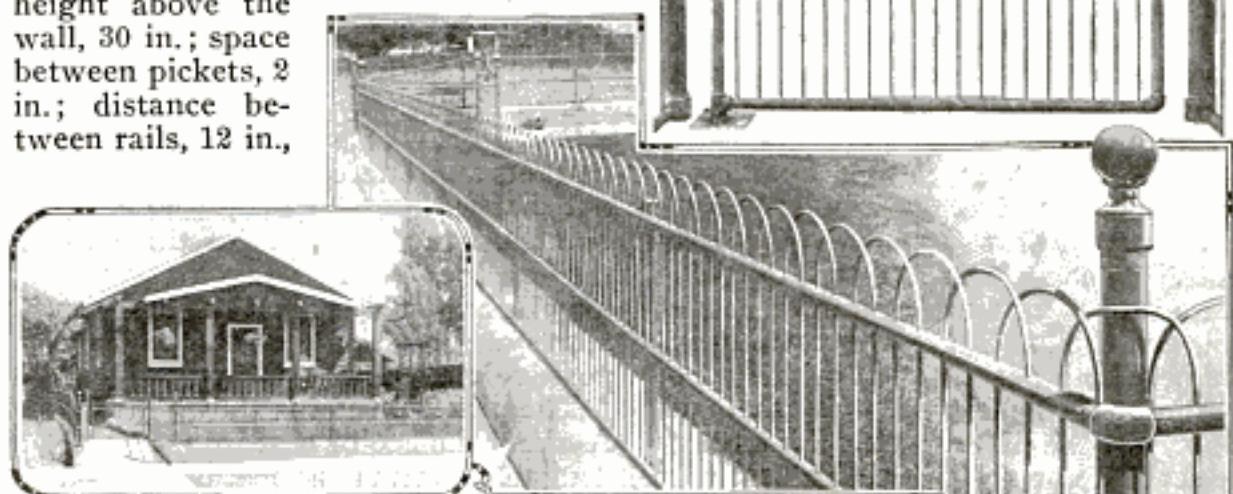
A Homemade Metal Fence

By T. T. STURGEON

THE metal fence shown was constructed by myself, who am only an amateur mechanic, and can be duplicated by any mechanic of average ability who has an accurate eye and a good stock of patience. The tools used to build and erect the fence were a hand drill press, a pipe-fitting outfit, and the ordinary set of bench tools; the jigs, and other appliances, illustrated were made of junk, picked up about the home shop.

The length of the fence is 100 ft.; the height above the wall, 30 in.; space between pickets, 2 in.; distance between rails, 12 in.,

enning the large number of pickets. The smaller things required are four 2-in. ball ornaments; eighteen 1-in. pipe



The Fence is Built Up of Pipe and Fittings, with Pickets of Heavy Wire and Attached to Short Pieces of Pipe Anchored in the Concrete Base, Either with Brimstone or Lead

and the posts were set about 5 ft. apart. The material used consisted of 320 ft. of $\frac{3}{4}$ -in. pipe for the rails and gate; 54 ft. of 1-in. pipe, to make 18 posts, 3 ft. long; four pieces of 2-in. pipe, 5 ft. long, and 1,500 ft. of No. 2 annealed fence wire to form the pickets. If soft-steel rods of the proper diameter, such as concrete-reinforcing rods, were used instead of the wire, it would eliminate the construction of the wire straightener and the work of straight-

caps; eighteen 1-in. couplings; twelve $\frac{3}{4}$ -in. ells; six $\frac{3}{4}$ -in. tees; one double-swing floor hinge; a box of $\frac{1}{4}$ by 3-in. stove bolts, and 30 lb. of brimstone, or crude sulphur.



This completes the list with the exception of the gate ornament, which once adorned a gasoline stove in a different form and was bent to suit its present use. The total cost of the material, including that of the 14-in. wall, was 51 cents per lineal foot.

The first operation in constructing the fence is to build the drill bench, and on it and the drill jig depends the accuracy of the large number of holes to be drilled. The table of the press is swung out of the way and a perfectly straight plank—one without a twist in it is absolutely necessary—12 in. wide, 2 in. thick, and 12 ft. long, is placed at the proper height with the drill about 2 ft. from its right end. The plank is adjusted so that its surface is level and at perfect right angles to the drill spindle, thus taking the place of the drill table.

The construction of the drill jig is clearly shown in Fig. 1. The grooved blocks at each end are hollowed out slightly larger than the diameter of the pipe, thus permitting a slight side play for centering by the screws, as shown at A. The spring clamp is pulled out when placing the pipe in the jig and snaps back to hold it securely against the centering screws, which are ordinary setscrews secured with lock-nuts. The holes in the top, or guide plate, are 2 in. from center to center, and are used to make the pattern rail only. The guide for the drill is half of a motor-car chain and is fastened loosely to the plate so that the jig may be set at an angle with the drill, if necessary, and still guide the drill true to the center without binding.

In drilling the pattern rail the outer end is supported at the proper height, the pipe is entered in the jig from left to right, and the first hole is drilled 1 in. from the end; then the pipe is shifted until the pin will slip through the guide hole in the top plate, through the hole in the pipe and into the base plate, which locks the pipe for the drilling of the next hole, and so on until the length of pipe is drilled, which will be about 125 holes. Extreme care must be used when drilling the pattern rail,

to take up the lost motion around the pin in the following manner: After the pin is in place, twist the pipe from the operator and also shove it to the left. For the next hole the opposite course is pursued, alternating for each hole. If this is not done, the variation of a small fraction of an inch on the same side of all holes will bring the last hole out of true $\frac{1}{2}$ in. or more.

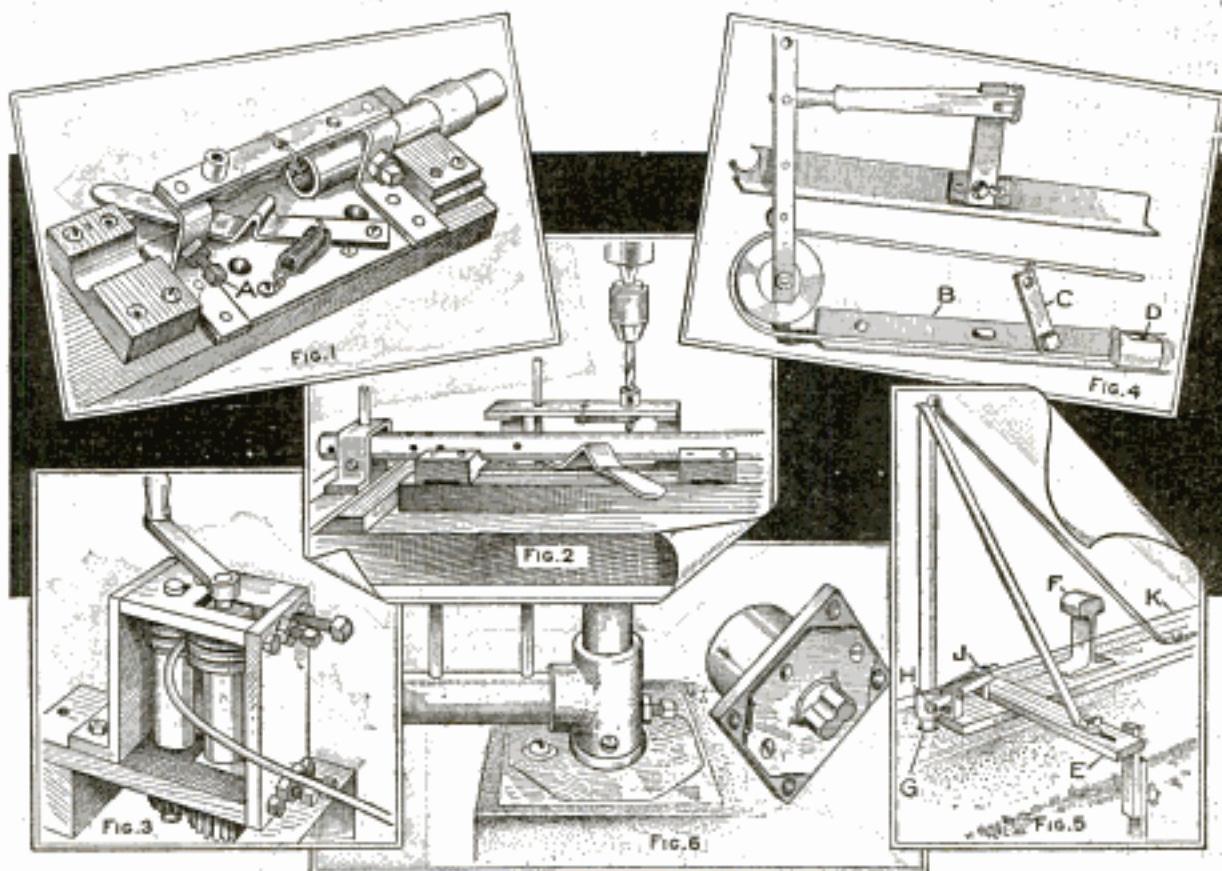
After the pattern rail is drilled, it is clamped on top of the next pipe, and a center punch of a size to snugly fit the drilled holes, in this case $\frac{9}{16}$ in. in diameter, is used to mark the next pipe. The operation of drilling the second pipe is the same as for drilling the pattern, except that the sliding jig is used to keep the pipe from turning under the drill, and the punch marks are used for a guide to start the drill. All the pipes are drilled in the same manner, except those intended for the bottom rails, which are drilled through the top only, except where necessary to put the sliding-jig pin through. The drilling operation is shown in Fig. 2.

The wire-straightening apparatus is shown in Fig. 3. There are many different forms of straighteners on the market, and one can be easily worked out that will answer the purpose. The one illustrated consists of three rolls, set in a frame of metal so that one roll may be adjusted against the other two. Gears are used on the rolls to make a positive movement.

The picket former is shown in Fig. 4. A circular piece of cast iron, $5\frac{1}{2}$ in. in diameter, forms a mandrel around which the pickets are bent. The bending lever consists of a piece of strap iron, $1\frac{1}{2}$ in. wide and $\frac{1}{2}$ in. thick, with a sash-weight pulley wheel bolted to it, so that it will clear the mandrel just enough to permit the picket wire to pass in between them. The guide and clamp to hold the wire is made of a piece of angle iron, B, and a short piece of strap iron, C, 1 in. wide and $\frac{1}{2}$ in. thick, with a notch filed in the lower end in such a manner that, when the wire end is against the stop D and the clamp is pulled to the left, it locks itself, and the wire is held tightly to the

angle iron. The wire is placed in the bender with the bending lever in the downward position. To form the picket, swing the lever to the vertical.

the jig shown in Fig. 5 was used to simplify the operation. The jig is placed on the wall with the clamp directly over the post hole, and the brace



The Jig That Takes the Place of the Drill-Press Table for Drilling the Holes Accurately in the Rails, the Wire-Straightening Machine, the Picket Former, the Post Setter, and the Gate Hinge

As the fence is to be set over a concrete wall, the posts must be prepared in such a manner that the fence can be dismantled at any time by making the posts in two pieces, one 25 in. long and the other 11 in. The short lengths of pipe are set in the concrete base so that the upper end extends above the surface just enough to fit on a coupling. The upper part of the post is screwed into the coupling. The bottom rail is bolted to the coupling, which just clears the surface of the wall; the other holes for the rails are 12 in. apart, thus leaving just enough end to screw a cap on top when the upper rail is in place.

In erecting this fence, the same procedure is followed out as in building a wood fence. When the wall is built, holes about $\frac{1}{2}$ in. larger than the posts are left at the exact location where the posts are to be set. In setting the posts

E, at the end of the side arm, is adjusted with the ground to hold the arm solid. A weight, F, is placed on the jig to hold it steady. The post G is then dropped into the hole and adjusted in the clamp H, by placing a pin through a hole in the coupling. The post is then raised or lowered by means of the wing nut J in the clamp, until some certain point marked on the coupling is in line with the guide line K. The top braces are then adjusted, and the post plumbed by sliding the lower end of the braces, the bolts holding them sliding in slots, until plumb, then clamped with the thumbscrews. The brimstone is melted and poured in the hole around the post and allowed to cool.

After the posts are all set, the rails are coupled together on the straight run with couplings, and on the corners with ells. They are then clamped to

the posts in their respective positions and drilled for stove bolts by means of a breast drill. The pickets are then driven in and the fence is complete, all but the gate.

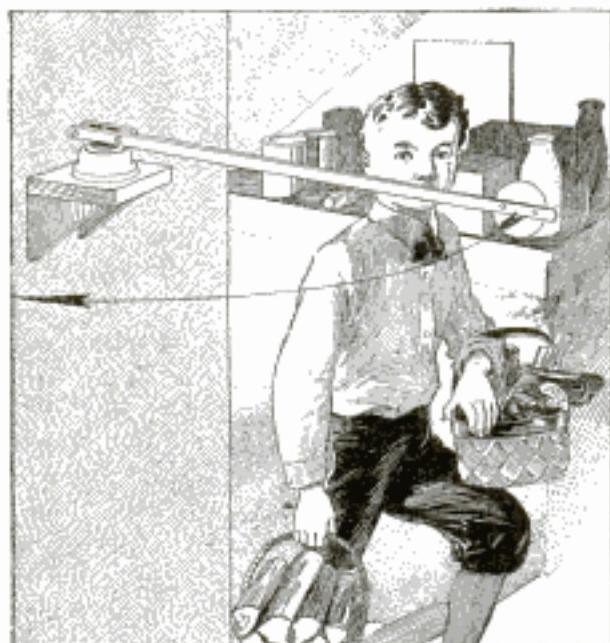
The gate is the most difficult part to construct, and the illustration shows better than words can tell its form of construction. The threading of the pipes should be all right threads and has to be done with the utmost accuracy. The two middle rails are run in on one side, and then back into the other side and calked. The pickets are then set, and the top rail put on by means of a run-back of each of the

short nipples on each side. The top bearing is simply a pipe plug screwed into the top tee, the square part being filed round to fit the hole in the supporting bracket.

The hinge used to hang the gate is shown in Fig. 6. This hinge is the type used for double-swing doors, and is countersunk in the cement walk and filled with a very heavy oil. As it is ball-bearing, the gate is absolutely silent in its action. There is no need of a latch on the gate, as the powerful springs of the hinge prevent any of the smaller animals from opening the gate.

Switch Arm for Use on Basement-Light Circuit

Although it is the usual custom to put a basement-light switch at the head of the steps for convenience, there



Long Arm Placed on an Electric Switch to Strike the Person Leaving the Basement Steps

is a serious drawback to this position. In a certain basement storeroom it became an annoyingly frequent occurrence to find the light burning hours after the person using it had left, for it was an easy matter to go out into the daylight and forget to turn the switch.

In order to avoid this waste of light, the device shown in the illustration

was adopted. First, the switch was removed and mounted horizontally on a small wood bracket, with the wires leading up through a hole in the center. A light wood arm, 15 in. long, was attached to the switch, as shown, so that the light would be turned off as long as the arm rested against the wall. When the switch is turned to the "on" position, the projecting arm forms a positive means of turning out the light, since it is right in the path of the person leaving the stairs. The card disk at the end makes it easily seen.—Contributed by Morris G. Miller, New Rochelle, New York.

A Protection for the Acid Bottle

The bottle used as a container for nitric acid, that is kept in a shop for etching steel, is often struck with some piece of metal and broken. As this is a dangerous acid when not confined, it is well to be careful and use all caution possible in handling the liquid. A good safeguard is to glue a cardboard disk to the bottom of the bottle, then coat the outside surface with glue, and when it becomes tacky, roll it in small particles of cork. The cork may be obtained from a fruit dealer selling imported grapes. When the glue hardens to hold the cork, it makes a very satisfactory guard against breakage. Owing to its touch, the bottle can also be used as a poison bottle for the home.

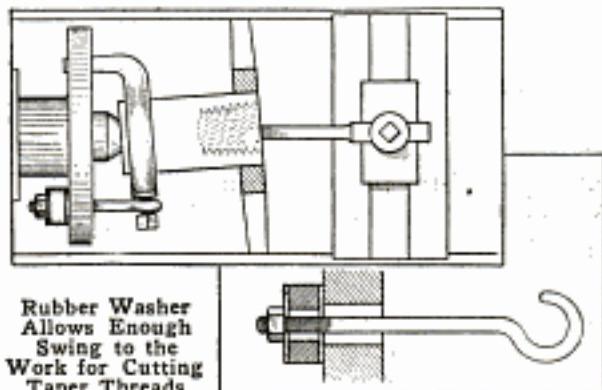
Mucilage Used to Stop Leak in Gasoline Connection

A leak started in the ground-joint connection between the gasoline-supply pipe and the carburetor on my automobile. It was in a place where it could not be reground easily, although I tried to stop it in this manner. Soap and other lubricants were used to no avail. The thought came to me that some liquid which gasoline would not cut might do, and I used a small portion of old mucilage which had become thick, applying it to the connection and letting it stand to harden, then screwing the joint together. This stopped the leak.—Contributed by Bert H. Stanley, Portage, Wash.

Holding Work in Lathe to Cut Taper Threads

In cutting an inside taper thread on a lathe, I have found the device illustrated an excellent substitute for a yoke that rocks on the lathe dog.

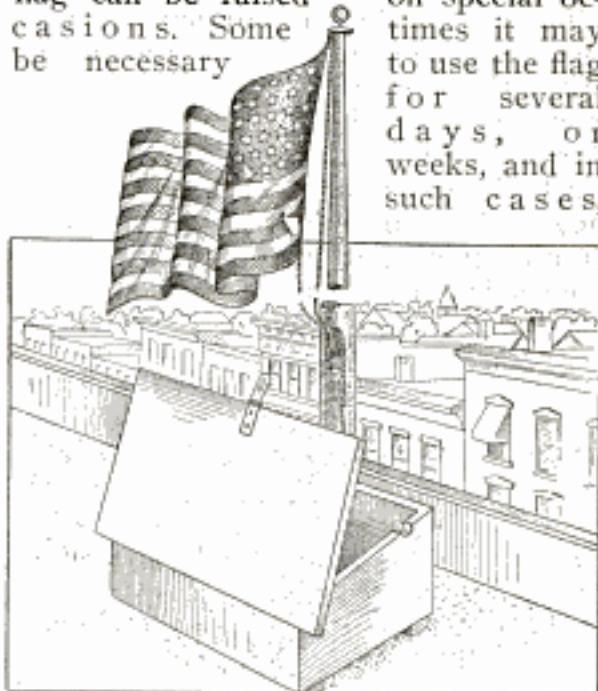
The device, which is only intended for light work, consists of a bolt, threaded for a nut on one end, and formed to a hook on the other, to engage the setscrew of a lathe dog. The bolt is amply long to receive a rubber washer, between two metal washers, on the threaded end. The rubber washer is made by cutting a 1-in.



length from a discarded clothes-wringer roll. The application is clearly shown in the sketch.—Contributed by L. Nash, Chesley, Ont.

Housing for a Large Flag

Many business firms have a flagpole on their buildings so that the national flag can be raised on special occasions. Some times it may be necessary to use the flag for several days, or weeks, and in such cases,



The Box Protects the Flag at Night, without the Need of Taking It from Its Halyards

the flag will be exposed to the weather at night unless it is taken from its halyards and put up again in the morning. One merchant, desiring to protect his flag and keep it as clean as possible, made a box on the roof, as shown in the illustration, to house it when not in use.

The box was made about 18 in. deep, 2 ft. wide, and 3 ft. long, which was large enough to hold two flags of the size used for such purposes. The box was placed on two timbers on the roof at the base of the flagpole. The cover was made slanting, with its edges projecting over on all edges. A notch was cut in the upper edge of one end to admit the halyards when the flag was placed in the box. This made it very easy to haul down the flag and store it for the night. A hasp is provided to lock the flag in with a padlock, and in this case the box was protected from view of the street by a balustrade on top of the building front.—Contributed by John Kohlbecher, San Francisco, California.

Street-Lamp Glare Shield

Any fixed form of light deflector for a street lamp was strictly forbidden in our city, and the one in front of our house caused considerable annoyance by its glare when we were sitting on the porch in the evening. The light on the porch, during the time it was burning, made an excellent burglar protection.

To overcome all difficulties I designed the deflector shown in the sketch, which can be easily placed on and taken off a lamp, and has given perfect satisfaction. It is in the shape of a shovel, the blade being made of galvanized iron and the handle constructed from an old broom handle. The position of the hooks by which it is hung, the manner of shaping the sheet metal, and the way in which it is placed on a lamp, are all plainly shown.—Contributed by Irving M. Hayward, Brooklyn, N. Y.

Hinged Molding for Window Screen

Window screens held in place by special molding strips can be easily removed for cleaning or other purposes, if arranged as shown in the illustration. In order to do this, the molding on both sides of the window should be sawed in two, so the lower piece will be a little

longer than the height of the screen. If the molding is already fastened in place, the lower pieces should be removed so their upper edges may be rounded off to permit the molding to swing either out or in, as desired, when pinned near its upper edge, as shown. Holes should be drilled and countersunk for loosely fitting wood screws, which are used as



hinge pins, and are fastened in place by being screwed into the window jambs. To lock the hinged strips in their regular upright position, a hole should be drilled near the bottom edge, and continued into the window jamb, to fit a wire nail, or bolt.

In using this arrangement both hinged strips, after being secured at their upper ends, are swung out, and the screen is slipped in place; it can then be swung to its regular upright position. To fasten it in place, the nails, or bolts, are inserted in the lower holes. In order to take out the screen, the molding must first be unlocked by the removal of the nails. The screen can then be swung away from the window and removed.—Contributed by M. Baudier, New Orleans, La.

Doweling Loose Bearings

In order to stop the turning of loose bearings in connecting rods, a simple method would be to provide the rod with a tightly fitting dowel pin, projecting sufficiently far to enter a corresponding hole drilled in the bearing. Care should be taken that the top of the dowel is always below the surface of the bearing metal.

Cover for an Automobile Starting-Crank Handle

An extremely handy addition to the starting crank of an automobile in winter is a piece of rubber hose placed over the handle. The usual type of crank is fitted with a metal sleeve of either brass, copper, or steel, and in winter the sleeve becomes more or less slippery, due to the ice and snow, resulting in making it very difficult to crank. The addition of the rubber sleeve over the metal one readily eliminates the trouble.

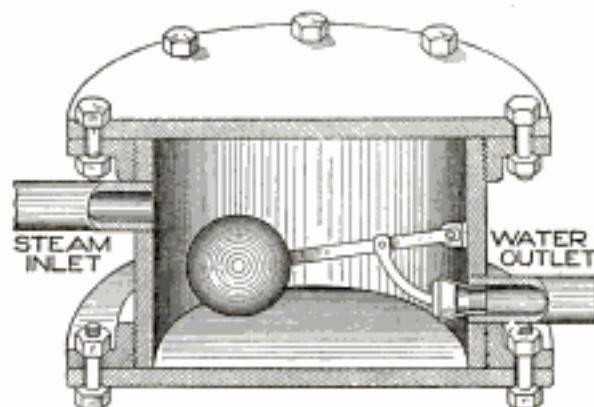
Removing Tar and Asphalt Spots

Do not use soap on tar or asphalt spots in cloth first, as this will set it in a way to make the cleaning almost impossible. Rub the spots with soft grease, and set aside until the grease penetrates the tar. Remove the tar and grease with gasoline, or by washing in hot suds. Asphalt should be well wetted with kerosene and left to stand, then washed out in turpentine or alcohol.

Easily Made Steam Trap

An inexpensive steam trap can be constructed from a piece of 8-in. pipe, 6 or 8 in. long, two flanged heads, and a float. The pipe is threaded for the flanges, which are to hold the heads after they are prepared. One side of the pipe is drilled near one edge, to receive a pipe from the lowest part of the steam system. The other side is fitted with a ball float and lever, hinged near its center. The float lever is fitted with an arm shaped properly to carry a tapered valve on that end which enters the outlet pipe.

The action of the trap is as follows: The water from the condensation in the steam system falls to the lowest part and enters the trap. When the level has risen sufficiently to lift the ball float, the valve is opened and the

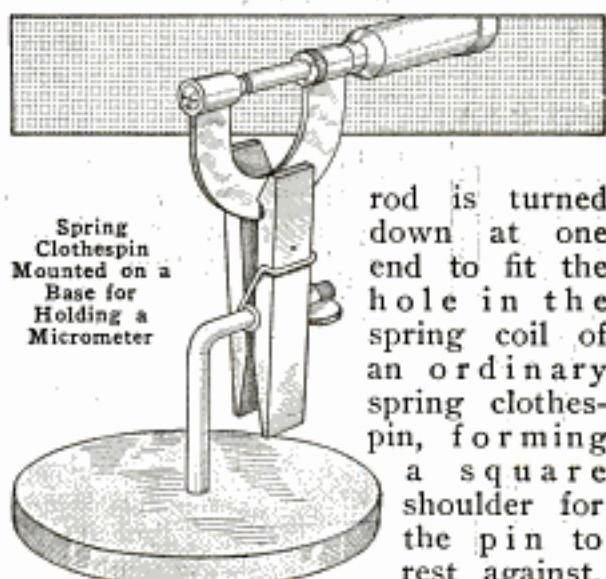


Steam Trap Made of a Large Pipe with a Float to Operate the Outlet Valve

steam pressure forces the water out. The lowering of the water in the trap allows the ball float to close the opening.

Micrometer Holder

A holder for a micrometer, which fully answers the purpose of an expensive one, is made as follows: A $\frac{1}{4}$ -in.

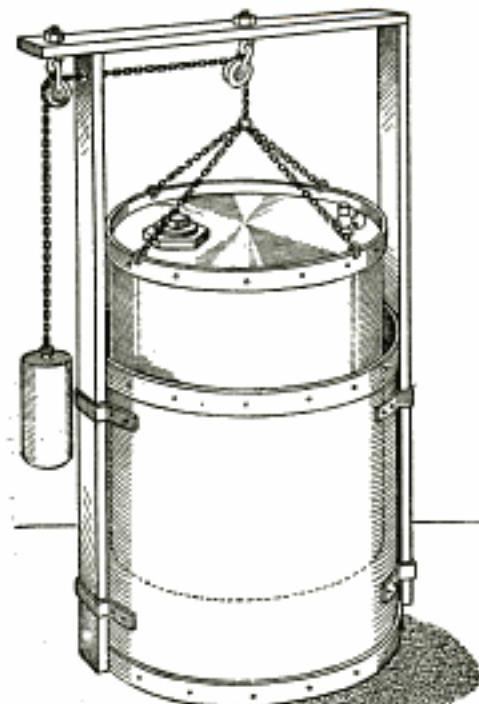


rod is turned down at one end to fit the hole in the spring coil of an ordinary spring clothespin, forming a square shoulder for the pin to rest against. About $\frac{1}{2}$ in. back from the shoulder the rod is bent at right angles, and the end is fastened in a metal base of sufficient weight to hold the micrometer rigidly. The length of the rod is optional. The end of the portion turned down is threaded and fitted with a wing nut. The manner of using the holder, with the clothespin as a vise, is clearly shown.

Tanks for Supplying Air at Low Pressures

In soldering metals, or melting them in small amounts, compressed air at low pressures can be used to great advantage in connection with gas burners. Power blowers are ordinarily used to obtain the necessary pressure, but a good, cheap substitute for small work can be made of two heavy cans, as shown in the illustration. Two sizes of cans should be obtained, so one may freely pass within the other. They should be open at one end, but otherwise air and watertight. The larger, or stationary, tank should be provided with four strips of metal placed in sets of two on directly opposite sides and fastened with rivets, or solder. The strips of

metal are formed to fit two wooden strips used as uprights for a frame which is connected at the top by a



A Low-Pressure Air Tank to Supply Air in
Burners for Working Metals Having
a Low Melting Temperature

crosspiece provided with two pulleys, one midway between the uprights, and the other suspended from an extension on one side. The upright on this side is drilled for a cable hole in line with the tops of the pulley wheels.

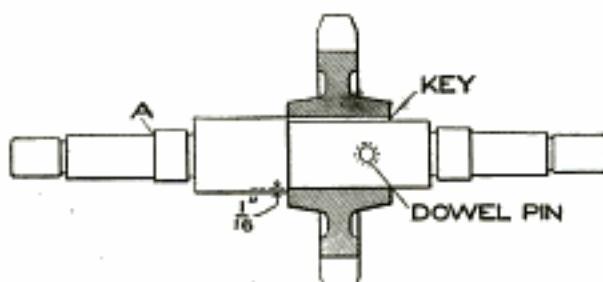
Two openings are made through the closed end of the smaller or movable tank, one to serve as air outlet and the other as an inlet. The outlet is made sufficiently large to fit an ordinary gas cock, which should be soldered in place, and connected to the gas burner with a suitable rubber hose. The inlet opening is cut to fit a suitable pipe flange, which is soldered or riveted in place and fitted with a plug to open or close it. Four chains or cords are evenly spaced and connected to the rim of the movable tank, to hold it in an inverted position. They are fastened at their loose ends to the weight cord, which passes over the pulleys to a regulating weight, used to govern the descent of the movable tank. To get higher pressures than produced by the unbalanced weight of the tank, additional weight may be added on the tank.

To operate the device, the lower tank is filled three-quarters full of water. The movable tank with its outlet open is placed in its upper position, and then closed up with the plug, and connected to the gas burner by a rubber hose. When the gas cock is opened, the excess weight of the tank will cause it to descend, forcing the air through the rubber hose to the burner. When no more air can be forced out of the upper tank, the outlet must again be opened and the tank raised to its upper position. With the outlet again plugged, the operation will proceed as before.—Contributed by J. Koestner, Brooklyn, New York.

Repairing a Broken Magneto Drive

The combination sprocket and shaft, driving the magneto of an automobile gasoline engine, was fractured at a point marked A. The break may have been caused by defective material, or perhaps the heat treatment was not of the proper kind. The shaft was of such design that the drive sprocket was forged integral with the shaft; then, too, the entire piece was heat-treated and ground. This made it an extremely expensive part if a new one had to be purchased.

To make a repair, a new shaft was turned up, without a sprocket, having the same dimensions as the broken shaft, which was removed from each side of the sprocket and the faces of the latter were ground flat on a grinder. A hole was then bored and reamed



New Shaft Replacing a Broken One Consisting
of Shaft and Sprocket in One Piece

centrally in the sprocket, to fit on the new shaft. A keyway was cut in the sprocket and one to match it in the

shaft, and a hole was bored for a dowel. The shaft was then casehardened and ground to a press fit in the sprocket bore, with a shoulder $\frac{1}{16}$ in. high to provide a stop. When the sprocket was in place a pin was driven into the hole and riveted on both ends.

Drawing-Board Cover

Having trouble with dust settling on my drawings over night I made a cover, as shown in the illustration, that

can be easily drawn in place and does not interfere with the work on the board. Two

pieces of steel, each $\frac{1}{8}$ in. thick, $\frac{3}{4}$ in. wide, and about 2 in. long, are secured at the right end of the board, one on the top and the other on the bottom edge. An ordinary window shade with a spring roller of the proper length is fitted between the two pieces of steel. When not in use, the roller with shade hangs under the board as shown by the dotted lines.—Contributed by Lawrence L. Lane, Jackson, Tenn.

Temporary Repair for a Burned-Out Fuse Plug

When a house fuse plug "blows" out and there is no other at hand, take a bit of tin foil—the covering from a pack of tobacco or chewing gum will do—and fold it once,

making the strip about $\frac{1}{2}$ in. wide, then lay it over the contact points of the plug, as shown, and screw the plug into

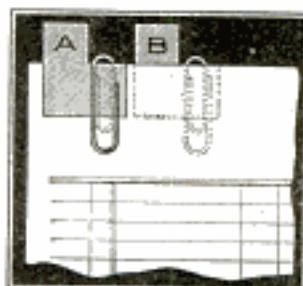
the receptacle. This will make a connection, and will not produce any more body than if the ordinary fuse wire were used.

CA streaked top lining on an automobile can be made uniform in color by applying a dye of the proper shade while the top is upside down.



Making Index Cards

Anyone making his own filing systems will find the method illustrated one of the quickest and easiest for constructing index cards. To one of the regular cards in the cabinet attach a piece of cardboard, or any suitable material, cut to the shape shown at A, with a paper clip to keep it in place. The target can be slipped along on the card or it can be placed behind it, as shown at B. Owing to the manner of fastening, any number of cards can be made with targets.



A Twine Holder

A serviceable twine holder can be made from a wire guard of an electric lamp. The guard is fastened to the wall, or other support, with a single staple over the wire ring at the top.

Lift the guard and insert the twine from the back side. The weight of the ball will hold the guard in place. The twine is taken from the small-end opening in the guard.—Contributed by W. H. Sargent, St. Johnsbury, Vt.

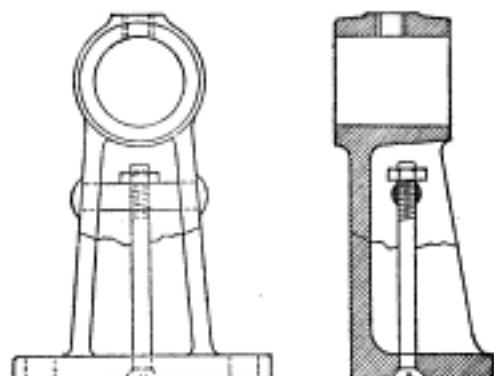


An Acid Test for Metals

File, or grind, the pieces to be tested and polish them smooth, then place them in a dilute nitric or sulphuric-acid solution for a day. Wash and dry the pieces, and if they are of the best steel, the surface will have a frosty appearance. Ordinary steel will have a honeycomb surface, and iron will present a fibrous structure running parallel with the direction in which the metal was worked.

Repair for a Small Broken Bracket

A simple and cheap repair for a broken automobile-fan bracket, or a similar casting, can be easily made as

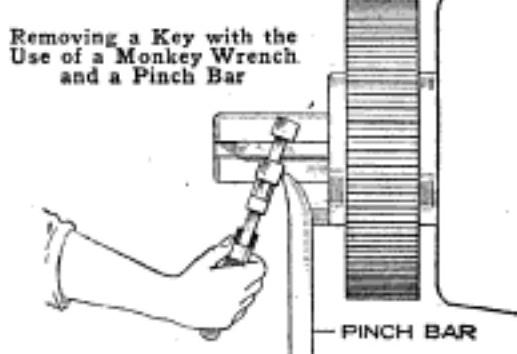


The Parts of the Casting are Held Together with a Screw, or Bolt and Nut

illustrated. A hole is drilled through the sides of the upper, or bearing, portion, and a rivet, or suitable rod, inserted and securely riveted in place. The two parts should then be assembled, and held together with clamps, while a hole is drilled and countersunk through the base and rivet body, to fit a suitable flat-headed machine screw. When assembled, the parts are securely held in place with the screw and nut connecting the base with the rivet.

Removing a Plain Key with a Monkey Wrench

Considerable skill is frequently required to remove plain keys fitted in places where it is impossible to get at them with a drift. One of the simplest

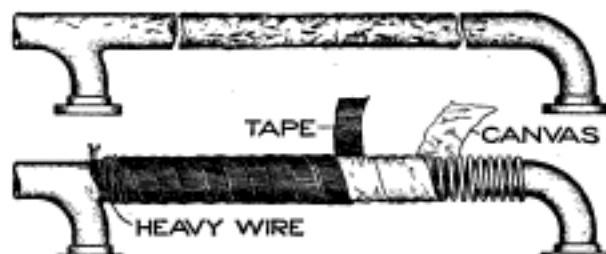


successful methods of obtaining the desired result is the use of a monkey wrench and pinch bar, as shown in the

illustration. For this purpose a wrench should be used that has sharp edges on its jaws, so these can get a good grip on the key. To further improve the method, grooves may be cut on opposite sides of the key, so the jaws will fit better when straddling the key at a slight angle with the face of the keyed machine part. By using a pinch bar against the movable jaw, sufficient force can be applied to remove the key, unless it is so tightly driven, or rusted in place, that it will have to be drilled out before it can be released.—Contributed by J. V. Romig, Allentown, Pa.

Emergency Repair on Automobile-Engine Manifold

The water-outlet manifold on the gasoline engine of an automobile was very old and corroded, and the pressure of the circulating water fractured the center portion of the pipe and made two pieces of it while out on the road. The repair illustrated was done in a short time and enabled the driver to



Substitute Manifold Made of Canvas and Electricians' Tape over a Spiral Wire to Form a Hose

reach home, after which it served the purpose until a new manifold could be obtained.

A close-wound spiral spring of ordinary iron wire was wound around the circumference of the hand pump. The spiral ends were fastened to the broken ends of the manifold. Strips 3 in. in width were then cut from an old piece of canvas found in the tool box and wound tightly around the spring for the full length, after which electricians' tape was wound tightly over the canvas. White lead was inserted at both ends to prevent leakage, and the ends were then clamped to the metal with wire.

Building a Home

By GEO. M. PETERSEN

PART II—Planning the House

AFTER the lot has been selected and the location of the house decided upon, the amount to be used for building purposes should be fixed. It is impossible to set a rule for the value of the building, but the cost should not exceed an amount that can be readily liquidated when the time comes for settlement. It is best to figure the amount of rent a person is paying, or can afford to pay, and see if it will carry the building account. Some of the items which are included in the carrying charges of a property are lost interest on the money invested; interest on the mortgage; fire insurance; city and county taxes; water tax; assessments for repaving the street and building new sewers; repairs, and depreciation. If the rent, which is credited to the house account, will pay 10 per cent gross on the investment, it is reasonably certain that the property will be self-supporting, but be very careful to have the amount come under rather than over the fixed expenditures of the ordinary outlay or that which a person can handle financially.

When the cost is figured and the amount known, it is very easy for an architect to make preliminary sketches and submit them for approval. Upon receipt of the sketches the home builder should carefully look them over with a view of placing the furniture. Many houses have been completed before it was discovered that there was no wall space for the piano, the buffet, or bed. Note the layout for the bathroom and its size, which should never be less than 6 ft. square. A few furniture dimensions are given herein to assist the owner in checking the plans for furniture space.

Single bedsteads are from 3 ft. to 4 ft. wide, the three-quarter bed is from 4 ft. to 4 ft. 6 in. wide, and the double bed is 5 ft. wide. There are also some dormitory beds that are only 2 ft. 8 in. wide. All bedsteads are from 6 ft. 6 in. to 6 ft. 8 in. in length. Headboards

range from 5 ft. to 6 ft. 6 in. in height. Bureaus and dressing tables vary a great deal in size and length, but a space 4 ft. long and 1 ft. 8 in. deep will accommodate them. The average height, exclusive of mirrors, is about 3 ft. Chiffoniers are about 3 ft. long, 1 ft. 8 in. deep, and 4 ft. 6 in. high. Wardrobes come in two general sizes, namely, 4 ft. 6 in. wide, 2 ft. deep, and 8 ft. 2 in. high; and 3 ft. wide, 1 ft. 6 in. deep, and 6 ft. 9 in. high.

Sideboards vary from 4 ft. to 6 ft. in length, and from 1 ft. 8 in. to 2 ft. 4 in. in depth. Upright pianos run from 4 ft. 10 in. to 5 ft. 6 in. in length, 4 ft. to 4 ft. 9 in. high, and 2 ft. 4 in. deep. A space 2 ft. deep and 4 ft. long should be allowed for the kitchen range, but it is better to select this piece of furniture before planning the house, on account of the variation in the size. The illustration shows how the layout for the furniture will appear on the plans.

It is advisable also to check up the closet space shown on the plan and see that no closet is less than 20 in. deep. Stairways should be considered as to the run or tread, which should not be less than 8 in. for basement stairs, 9 in. for inside stairs, and 12 in. for porch steps. The proper proportion of treads and risers can be figured by adding them together, and their sum should be from 17 to 17½ in. The headroom in the basement must not be less than 7 ft. from the top of the concrete floor to the bottom of the girder. Always see to it that plenty of nails are used, as it is better to have too many than not enough. See that each stone in the foundation is laid on a solid bed of lime and cement mortar, and have the plates laid in a bed of mortar. Use a good grade of building paper between the floors and for the oversheathing. The shingles should be put on the roofs with galvanized, cut nails. The most common symbols for designating lighting fixtures, and sundry other equip-

ment, are shown in one of the illustrations. There are many tricks used by dishonest contractors, and a few of them are mentioned here as a warning. Ashes, as well as other refuse, are used in constructing concrete foundations; 2 by 3 in. studs for partitions in the place of 2 by 4-in. material; chestnut, or yellow-pine doors, flooring, and trim, where oak is specified; tile seconds in bathrooms. Tile seconds are slightly discolored, and when laid have a poor appearance. Redwood window frames are used where white pine is specified; a poorer grade of flooring and a smaller furnace than called for in the specifications are often substituted; two registers are connected on one run of pipe; and numerous other fraudulent practices to save on the price of the material going into the house are resorted to.

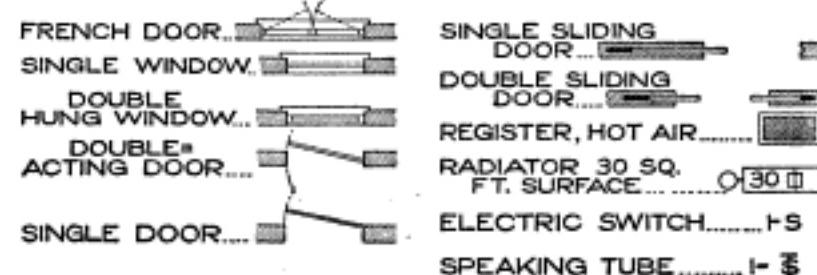
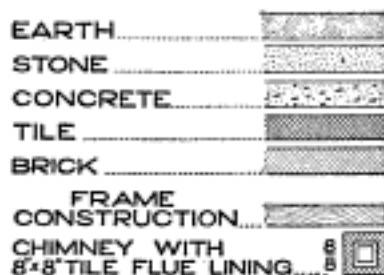
The hardware is another item where there is opportunity to cheat. It is not uncommon to find plated steel where bronze is specified, as there is no way of distinguishing one from the other except by using a magnet. Naturally the plated steel will attract the magnet and the bronze will not affect it. As bronze hardware costs almost three times as much as steel, it is quite a temptation for the dishonest contractor to use the cheaper grade

nishes, as they will present a high gloss that will not stand in use.

If it is desired at some future time to make additions for more rooms or sleeping porches, or to finish off rooms in the attic, the house should be so arranged that this work may be done without the necessity of remodeling the entire house.

Mortgage Loans

If it is necessary to borrow money for building purposes, there are three sources from which it can be obtained by placing a mortgage on the building, namely, a private party, a savings bank, or a building and loan association. A private lender will usually give a larger loan on the property than a savings bank, but the bank, on the other hand, charges a lower rate of interest. The interest on either of these mortgages is payable semiannually while the building and loan association mortgages require a weekly or monthly payment on the principal, together with interest on the unpaid balance. The amounts of these payments vary, but are usually figured out so that the mortgage is fully paid up in from 7 to 13 years. Most building and loan companies require a monthly payment of \$10 for each \$1,000 loaned. The rate of interest is about the same as charged

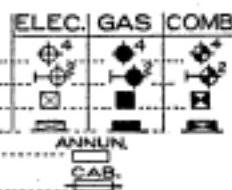


as a substitute. Painting is another thing to be watched closely, and about the only way to know that the proper material is used

is to have the painter open the original packages and to see the colors mixed on the job. Look out for cheap var-

CEILING OUTLET... 4 LT's
WALL " 2 "
FLOOR " 1 "
BASE "

ANNUNCIATOR.....
CABINET.....



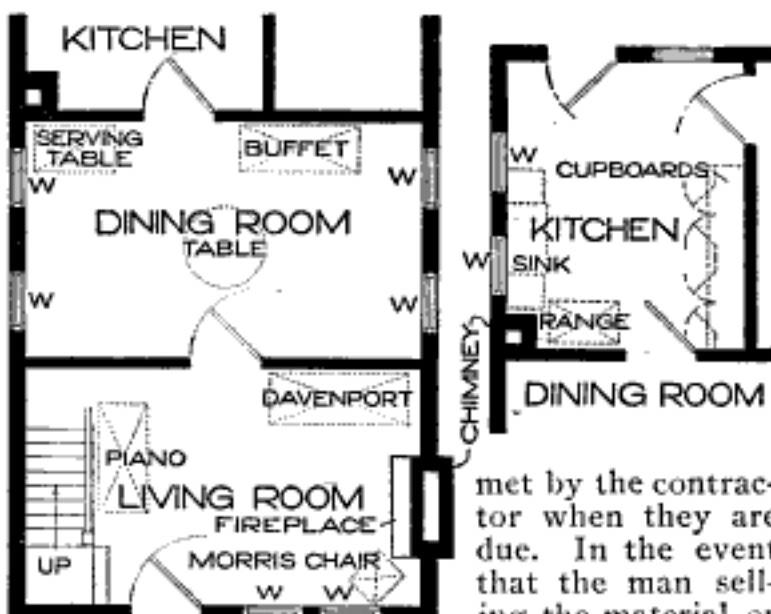
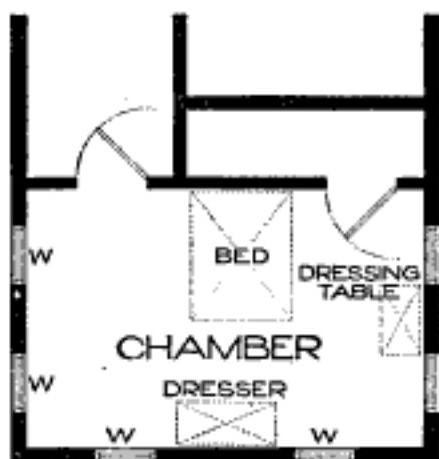
The Novice will Find Many Characters or Symbols on the Plans, and It Is Necessary to Know Them So That the Work may be Checked, as Well as the Kind of Material and the Location of the Fixtures

by the savings bank, perhaps $\frac{1}{2}$ of 1 per cent higher, and the amount loaned is greater, so that for the average person who really wants to own a home, the building and loan association proposition is a good one.

There are two regular kinds of

mortgage loans, the straight mortgage and the building-loan agreement. The latter is sometimes called a progressive

the state of New York will be considered. In this state the owner is fully protected so long as the payments are



Many Houses have been Completed Before It was Discovered That There Was No Wall Space for the Piano, Buffet, or Bed; Consequently These Locations must be Noted on the Plans, and Spaces Arranged for Them

loan, the amount of the loan being paid to the borrower in successive sums as the construction of the building progresses. This kind of a loan is usually obtained from a private party and occasionally from a loan association, but seldom from banks. The building-loan agreement is usually drawn up in legal form similar to a mortgage, but stating when the payments are to be made, such as a certain amount when the foundations are in and the framing commenced; another amount when the building is under roof; another when plastered, and the remaining amount when the house is completed. A copy of this agreement is filed in the office of the clerk for the county where the building is located, which protects the mortgagee's interest. This style of a mortgage is very desirable for the builder, but since the loan is made from the plans and specifications instead of from the completed building, very few mortgagees care to make such loans.

Mechanic's-Lien Law

There is another important thing which the owner must watch closely, and that is the mechanic's-lien law. This law differs somewhat in various states so that it would be impossible to give all the laws in this article. As an example, however, the lien law of

met by the contractor when they are due. In the event that the man selling the material, or the mechanic, is not paid by the contractor, he may file a lien on the property owner and the contractor jointly. If the building is not finished at the time the lien is filed, the owner has the right to finish the building and deduct the amount expended to complete the building from the amount of the contract. Any balance which may be still due the contractor is then paid to the lienor or lienors in the order in which their liens are recorded, and any balance which may remain after all liens are satisfied is turned over to the contractor. If sufficient funds are not due the contractor to satisfy all liens the only redress that may be had by the lienors is a deficiency judgment against the contractor. The liens are all paid in full, when possible, in the order in which they were filed, except that all labor claims are paid before the parties selling the material can collect their claims, and the subcontractor comes last on the list.

If the owner refuses or neglects to pay the contractor, the property may be sold at auction, and the amount so realized is used to pay up the claims against the building. If, however, there

is a mortgage on the property, this must be paid, or assumed, by the party bidding it in, as the first mortgage is a first lien on the property and must be protected.

In some other states it makes no difference whether the contractor has been paid in full or not, the persons who have not received their pay for materials or labor can collect from the owner.

Building Contracts

There are three principal kinds of building contracts in use at the present time, viz., straight contract, lump-sum contract, and percentage contract. The first mentioned at one time was the most popular, but the percentage contract is rapidly gaining ground, as it is by far the cheapest and most satisfactory method of doing construction work.

The straight contract is one in which the contractor agrees to do the entire job for a specified sum of money, to be paid in fixed sums at certain times as the construction progresses. This form of contract gives the contractor a chance to use poor material and slight the work to save a few dollars.

A lump-sum contract is one wherein the contractor agrees to perform all labor and furnish all material necessary for the proper completion of the building, for cost, plus a lump sum for his profit. This form of contract leaves the contractor no reason for slighting either the material or the labor, nor can he gain anything by running the expense higher than necessary.

A percentage contract is an agreement whereby the contractor agrees to build the house for cost, plus a certain percentage for profit. This is the proper and most satisfactory method of building, and is rapidly replacing the straight contract among those well informed in building construction. The main thing, however, is not so much the kind of agreement the contractor works under as his reputation for doing the work at a reasonable margin of profit, and well. The better contractors in some places decline a contract job, as they are kept busy on percentage work.

Summed up briefly, the straight contract either forces the owner to pay an unreasonably high price for the house, or else tempts the contractor to substitute poor materials and cheap labor in order to break even, should he have forgotten something when figuring the cost. This means that the owner must supervise the work very closely to avoid substitutions. If the contractor sets out to make up a loss, he will succeed, no matter how close the supervision, and for that reason the work should not always go to the lowest bidder.

With the percentage contract, however, all the tricks of the trade and forgotten costs are eliminated. The owner need not worry about the quality of the materials or labor, as the contractor has nothing to gain by slighting them. The contractor is really put on his honor and works as the owner's agent in getting the best results.

Shaping Irregular Surfaces on a Metal Planer

Considerable skill and care is required in planing irregular surfaces to a definite outline, but with the aid of the tracing arm and template of the desired shape, as illustrated, the work can be easily and accurately done.

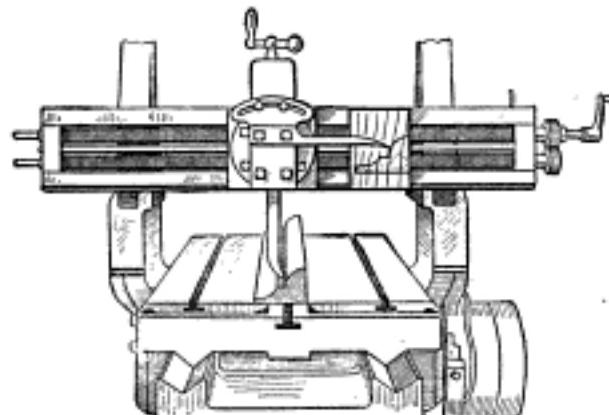
To make the necessary changes, one of the straps on the tool post, for clamping the tool, must be removed—either

the upper or lower can be used, whichever is most convenient. In its place is attached the tracing arm, being a duplicate of the removed tool strap, but having a long, rigid extension on one side terminating in a dull, bent chisel point for following templates. The outline to be planed is marked off and cut out of a hardwood block, or thin metal plate. This is fastened to a suitable block for clamping it to the planer cross rail, so that the template and the

outline of the work, when finished, both have the same position relative to the planer bed. If possible, it is best to mark the desired outline on the work before machining it.

In setting the tool, special care should be taken to see that it will start at the place on the work corresponding to that occupied by the tracing arm with respect to the master template. If this precaution is not taken, the tool may either cut too much, or run off, and the piece will be spoiled. If the desired shape is very irregular, several kinds of tools may have to be used, so that, in setting a new tool, it is best to locate it and the tracing arm on some finished part of the work.

Both the horizontal and vertical feed must be operated by hand, unless the



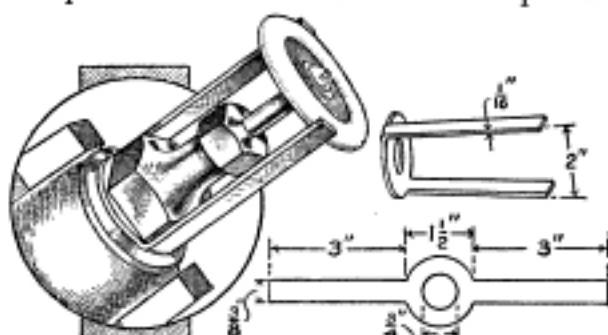
The Pointer Following over the Master Template Guides the Tool in Shaping the Work

outline is very simple. In such cases it might be advisable to remove the horizontal-feed screw in order to secure an automatic side feed, produced by a spring, or cord and weight, attached to the planer head, which tend to keep the tracing point—which should be strengthened for this purpose—pressed against the master template.—Contributed by A. Kerbaugh, Allentown, Pa.

Locking a Valve

The control valve on a water tank in a shop was almost worn out, and the constant vibration caused the valve to work loose. To eliminate this trouble, a clip was made to hold the handle in position. A piece of $\frac{1}{16}$ -in. sheet brass was cut to the dimensions shown,

after which it was bent to form the shape of the letter "U." The clip was



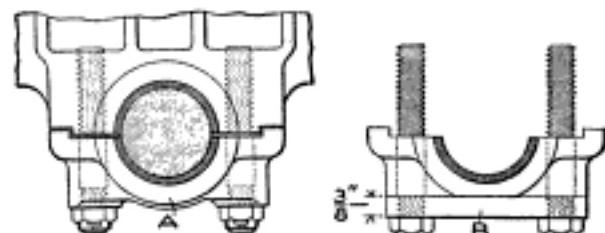
Clip to Fasten on the Valve to Hold the Stem from being Turned by Vibration

then placed in such a position on the valve that the two projecting arms held the valve wheel in place.

To Prevent Broken Bearing Caps

One of the most frequent gasoline-engine breakdowns is the rupture of a crankshaft-bearing cap. These caps are usually made of aluminum, and the fracture occurs at the point A. The trouble, in most cases, is due to screwing down the bearing studs too tightly, thus causing a strain on the metal in the center.

To eliminate such accidents the following method will be effective. The first operation consists of facing off the lower surface of the cap on a planer, or milling machine. A piece of $\frac{3}{8}$ -in. cold-rolled steel is then cut to fit the shape of the cap and drilled for the



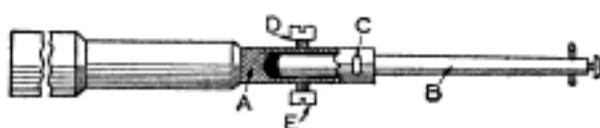
Bearing Cap Planed Off Level, to Receive a Steel Strip to Take the Strain off the Studs

studs, after which it is bolted in position, as shown at B. In this manner the entire strain imposed by the two nuts is carried on the strip of steel.

CThe forward gear on an automobile should never be engaged after reversing until the car is practically standing still.

Adjustable Boring Bar

Quite frequently a tool in a boring bar is to be adjusted for a deeper cut when the cutter is at the inner end of

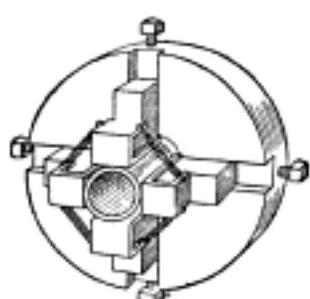


A Boring Bar That can be Adjusted to Make Small Changes without Resetting the Tool

the work. In an ordinary bar, this adjustment can usually be made only after the tool is withdrawn from the work. The illustrated bar overcomes this difficulty. The main bar A is drilled slightly larger than the diameter of the tool holder B, which is held in place in A by means of a taper pin, C. The tool holder B can then be swung back and forth slightly, but is held in any set position by the adjusting screws D and E. When starting an in-cut, the bar B should be held by the screw E only. If it is desired to take a deeper cut when returning, the screw E should be loosened slightly and D turned up tight, again holding B in a rigid position, but at a new setting.—Contributed by Jos. J. Kolar, Maywood, Ill.

Holding Protection Strips on Chuck Jaws

The rechucking of finished work usually necessitates the insertion of copper or other soft protection strips between the work and the jaws. These strips are not only hard to get in place, but they drop out easily and unexpectedly



when the jaws are loosened in centering the job. A simple means of preventing this annoyance is shown in the sketch. Make strips to conform to the shape of the jaws, as shown, but allow for an extra width of about $\frac{1}{8}$ in. on each side for drilling holes of a diameter to loosely fit the connecting spring

wires as shown. In adjusting the jaws, the protection strips will move with them, being held in place by a spring of the same strength on each side. This scheme will work on any number of jaws, and is particularly valuable when a large number of pieces must be rechucked.

Changing a New Valve Stem to Fit an Old Valve

In filling an order for a new gate-valve stem of the nonrising type, one was sent which lacked about $1\frac{1}{2}$ in. at the inner end, as shown in the sketch, to permit closing the valve. There was sufficient extra length on the outer end of the stem to allow it to occupy a lowered position without causing

any interference between the hand-wheel and packing-box gland. A hole was drilled, $1\frac{1}{2}$ in. above the shoulder A, and a pin, B, corresponding in length and thickness to the diameter and thickness of the shoulder, driven into it. The shoulder was then chipped off, thereby allowing the stem to drop down to the closed position of the valve, and the pin to fit in the place previously occupied by the shoulder. The parts were then reassembled, the only difference being in the location of the stem, and the substitution of the pin for the chipped-off shoulder. All upward and downward movement of the stem was prevented by the pin, just as it would have been by the shoulder, but an increased length of stem was provided, enabling the valve to close tightly.—Contributed by F. S. Johnson, Corona, Cal.

Washing soda, gum arabic, and water make a good writing fluid for fine lines on blueprints.

To Locate and Correct Troubles in Direct-Current Dynamos

By A. E. ANDREWS

PART III—Speed and General Suggestions

Speed Too High

If the governor on the engine fails to respond quickly under a varying load, adjust it to the proper regulation if possible. It should be governed closely from "no load" to "full load" with the proper steam supply. Where a series motor takes too much current for a given load and the motor runs away, put in a shunt, and regulate until the proper current is obtained. If a series motor is run on a constant-current circuit, use the proper regulator for controlling the magnetism of the field for a varying load.

To remedy a motor running at a too high speed on a constant-potential circuit, put in a resistance to cut down the current; use the proper regulator or controlling switch, or change to an automatic speed-regulating motor.

If the regulator, or field rheostat, is not properly set, or the voltage is too high for a shunt motor, the speed will run high. To make the proper change, adjust the regulator, or field rheostat, to control the speed, in the first instance; and use the proper voltage and rheostat, in the latter.

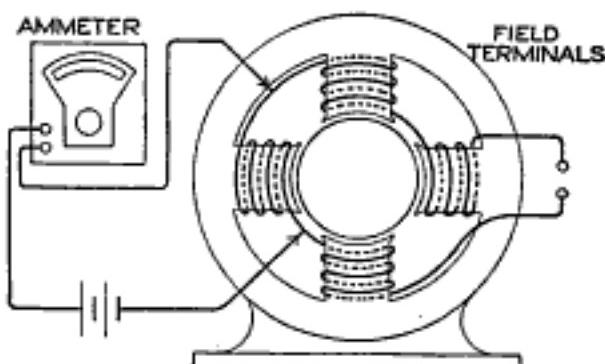
Speed Too Low

A low speed may result from the same cause as a high speed in respect to the engine governor, and its remedy is the same. An overload of too many lamps on the circuit; a short circuit in the armature; striking or rubbing of the armature on the pole pieces, friction or a weak magnetic field, may also cause low speed, and remedies for these troubles have been described in a previous chapter.

Motor Stops

If a motor stops, it may be due to excessive voltage on a constant-potential circuit; to excessive amperage on a constant-current circuit; to friction, or too great a load on the pulley. Open the switch, locate the trouble, and remove the cause. Keep

the switch open and the arm of the rheostat on the position "off" while locating and repairing the trouble, then close the switch and move the arm gradually to the position "on," to see if everything is correct. With a



The Manner of Attaching an Ammeter to Test Out the Field Coils for an Open Circuit

series motor no great harm will result from the motor stopping or failing to start. If it is a shunt motor on a constant-potential circuit, the armature may, and probably will, burn out, or the fuse blow.

A motor will stop on an open circuit caused by the melting of the safety fuse; by a broken wire or connection; by brushes in contact; by an open switch, or if the current fails, or is shut off from the station. Open the switch, locate and repair the trouble. If a fuse is out, put in a new one, and in case of a broken line, find it and make the repair. See that the brushes are in close contact. If a switch is open, close it, but before doing so, see that the starting resistance is in the circuit. In case of current failure, open the switch, return the starting lever to the position "off" and wait for the current, testing from time to time by closing the switch and moving the starting lever to the first closed-circuit position.

A complete short circuit of the field will cause a motor to stop. Test out for the fault, and make the repairs if possible. A method for making the

test is shown in the sketch. The ammeter should read the same for all coils if there is no trouble. It will read zero if the coil is open, and a maximum if the coil is completely shorted. Inspect the insulation of the binding posts and the holders. Poor insulation, oil, dirt, or copper dust may cause a short circuit.

The same trouble will result from a short circuit in the armature, or complete short circuit of the switch. The same remedy is applied as in making the repairs for the field.

Motor Runs Backward against the Brushes

This trouble will result in making the connections the wrong way. Connect up properly by referring to the diagram sent with the motor. If a proper diagram is not at hand, try reversing the connections to the brush holders. Other changes may be made until the proper connections are found to rotate the armature in the right direction, then connect up permanently.

Dynamo Fails to Generate

This will occur from a reversed residual magnetism, caused by reversed current in the field coils. To correct, send a current from another machine, or from a battery, through the field coils in the proper direction. The polarity may be tested with an ordinary compass. If the connections of the windings are not known, try one and test; if not correct, reverse conditions, try again, and test.

Should reversed connections be the trouble, connect up properly for the rotation desired, using the proper diagram of the connections. See that the connections for the series coils, in a compound dynamo, are properly made, as well as those for the shunt coils. In case of the earth's magnetism interfering, use the same method as for reversed residual magnetism, which method also is applicable where another dynamo is in close proximity. If the brushes are not in the proper position, shift them until evidence of improvement is given. The position of the

brushes for the best generating power should be clearly understood, and is generally at, or near, the neutral point. A too weak residual magnetism must be treated in the same manner as reversed residual magnetism. A short circuit will produce the same results, and must be repaired as described in previous paragraphs.

Should a lamp socket, or other part of the line, be short-circuited, or grounded, it may prevent the building up of the shunt, or compound machines. Locate and remedy the fault before closing the switch.

If the field coils should be opposed to each other, reverse the connections of one of the field coils, and make a test. A compass should show the pole pieces of opposite polarity. If, after such a trial, the dynamo does not build up, try sending a current from another machine through the field coils in the proper direction. If the polarity then does not come up in the proper direction, cross the field connections, or remagnetize them in the opposite direction.

The cause of the trouble may also be an open circuit caused by a broken wire; by a faulty connection; by brushes not being in contact; by a fuse having melted or broken; by an open switch, or by an open external circuit. Repairs are made as described, and in the last-mentioned case make a test with the dynamo switch open and kept open until the repairs are completed.

Where there is too great a load on the dynamo and it fails to generate, reduce the load to the pilot lamps alone, for a shunt, or compound machine. After the dynamo comes up to a full voltage, as shown by the pilot lamps or voltmeter, close the other circuits in succession and regulate the voltage at the same time. Where there is too much resistance in the field regulator, or field rheostat, gradually turn the regulating switch to cut out the resistance, and watch the pilot lamps or voltmeter when the dynamo comes up to the voltage, then regulate, etc.

General Suggestions and Precautions

Never use ice water to cool off the bearings, as it may get into the armature and ruin it, unless it has been made waterproof as in the case of street-car motors. Do not shut down because of a hot box resulting from poor oil, dirt or grit in the bearings, tight journals, or too great a load or strain on the belt, until their remedies have been proven useless. If absolutely necessary to shut down, take the belt off the pulley as soon as possible. Do not allow the shaft to "stick" in stopping. Take the boxes, or bearings, out and cool them off naturally as soon as possible, and not in water, as this may ruin them. When cool, scrape, fit, polish, and clean the shaft, and test for free turning by hand, before belting up and starting again.

Cleanliness about a dynamo, or motor, is imperative. Dirt, oil, or copper

dust may prove a source of great annoyance or damage. Small tools, bolts, or pieces of iron must be kept away from a dynamo, as they may be drawn into, or fall upon, the armature and ruin it. Never allow loose articles of any kind to be placed upon any portion of a dynamo.

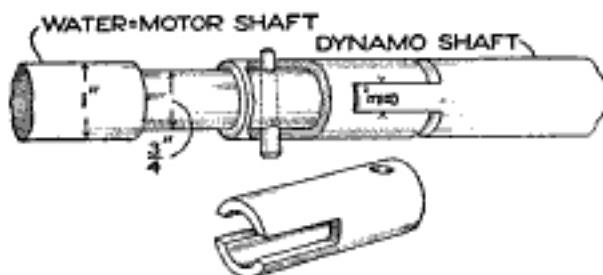
Brass, or copper, oilcans are the best to use, as they are nonmagnetic. All the connections must be large, clean, and firm. Look over and tighten the loose connections, screws, and bolts daily.

Always keep copper brushes raised from the commutator when the dynamo is at rest. Poor, cheap oil is not economical. Use none but the best of mineral oils, and filter new oils before using them.

Keep cotton waste away from the commutator; use canvas or cloth, and a pine stick makes a good burnisher to keep the bars clean and smooth.

A Detachable Shaft Coupling

The simple shaft coupling illustrated was made for a combination water motor and electric-generating outfit. The coupling is inexpensive and has the advantage of being quickly disconnected. The shaft of the dynamo had a $\frac{3}{8}$ -in. tongue, and that of the water motor an ordinary shoulder. A piece of steel tubing was then cut to the proper length, with the necessary slots on one end to engage the tongue on the dynamo shaft. A standard taper pin held

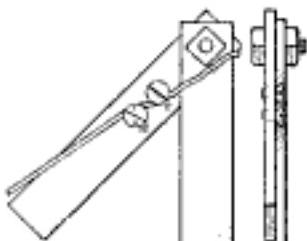


Sleeve Made of Steel Tubing Connecting a Dynamo Shaft with a Water-Motor Shaft

the tubing in position. To disengage, the taper pin is withdrawn, and the bushing is pushed to one side.

Simple Wire Straightener

The few parts necessary to make the illustrated wire straightener are as follows: Two pieces of $\frac{1}{4}$ by 1-in. iron; two flat-head machine screws; one bolt and nut, with a washer to fit, having a thickness approximately equal to the diameter of the wire. The $\frac{1}{4}$ -in. pieces should be drilled near one end to fit the bolt. In one piece two holes should be drilled and tapped for the machine screws, these being set in so their heads project an amount approximately equal to the diameter of the wire.



To use the straightener, open out the ends, insert the wire, and close up the parts; then draw the wire back and forth, holding the straightener at an angle with the wire so one screw bears against the top and the other against the bottom of the wire.—Contributed by D. C. Goff, Knoxville, Tenn.

Repairing a Reamer

A reamer is easily broken on the points of the cutters at the end. As the cost of these reamers is rather high, it



The Cutters are Ground Down and Then Wrapped with Fine Wire and Soldered

is desirable to repair them whenever possible. A very good repair can be made by grinding the end of each cutter down to a level a trifle lower than the break and winding this part with copper or soft-iron wire, then soldering it in place. The solder is then smoothed up with a file.

To Prevent Automobile Crank Handle from Sticking

Sand and dust collecting in the sleeve of an automobile starting-crank handle



will cause it to stick. To remedy this trouble, remove the handle and turn the pin down in the center about $\frac{1}{8}$ in. deep for a length of $2\frac{1}{4}$ in. This groove is then filled with ordinary packing. In this manner the sleeve will be kept well lubricated, and the sleeve will always slide loosely on the shaft pin. If two small grooves are cut lengthwise of the raised end portions, the grease, or oil, can easily reach these bearings.

An Adjustable Lap

In the ordinary lap, a piece of brass rod of suitable size is slotted in the



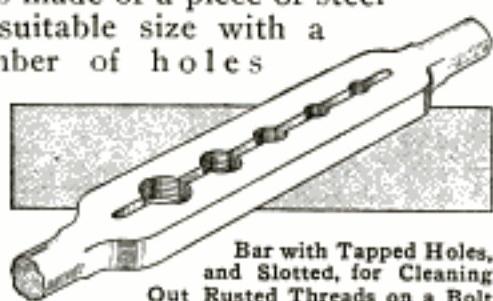
A Headless Screw Controls the Adjustment Accurately, and Holds the Parts Rigidly

center for some distance, and a wedge-shaped piece of metal is inserted in the slot. This will not give a fine, or solid, adjustment. An improvement, which

will give a better adjustment, consists of a tapped hole in the portion A, and a headless screw, C, used in it. The screw, when turned in, will force the portion B away to any desired position.

A Thread-Cleaning Tool

The tool illustrated will be of great help for anyone handling rusted bolts. It is made of a piece of steel of suitable size with a number of holes

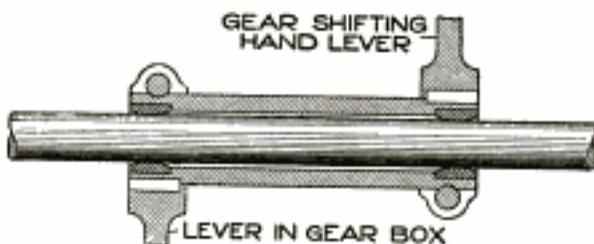


Bar with Tapped Holes, and Slotted, for Cleaning Out Rusted Threads on a Bolt

drilled of sizes necessary to tap with standard taps. After cutting the threads with the taps, the steel bar is slotted as shown. This tool, run over the threads of an old bolt, will clean off the rust and dirt that may have collected, making it an easy matter to start the nut, which otherwise would be a troublesome task.

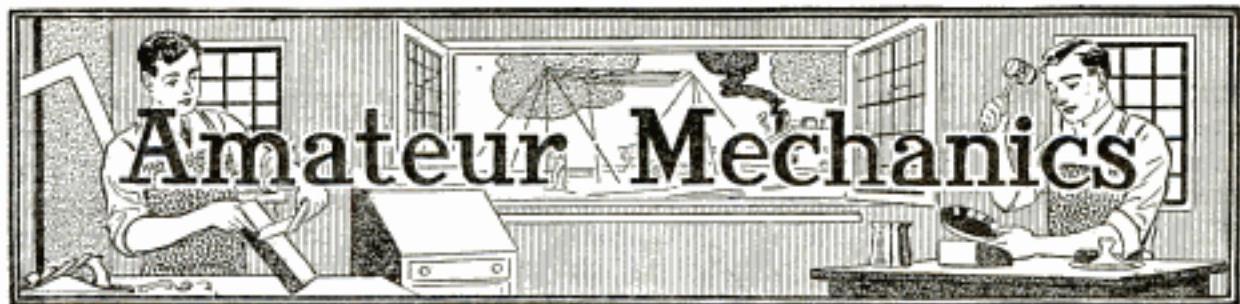
To Make Gear-Shift Lever Move Easily

Quite frequently a chauffeur will tug frantically at the shifting lever, in



LEVER IN GEAR BOX
Curved Inner Surfaces of Bushings on a Shifting Lever, to Make It Move Easily

an effort to engage the transmission gears, without success. Trouble of this sort is in many cases caused by the holding of the shaft connected to the shifting lever. To eliminate this trouble insert two bushings, one at each end, having curved surfaces. The clearance between the shaft and bushing should be not less than .005 or more than .01 inch.



Amateur Mechanics

How to Make Combined Kites

BY C. M. MILLER

PART I—A Dragon Kite

DRAGON kites are made as hideous as the maker can possibly conceive, and while the one to be considered is no beauty, it is more droll than fierce-looking. In general appearance the dragon and centipede kites are like huge caterpillars floating about in the air. The kite sometimes twists and the balancer sticks appear to be large hairy spines. Usually the tail end swings higher than the head. It is like so many single kites, pulls hard, and requires a strong cord for the line. The individual circular sections may number 20, and if placed 30 in. apart, would make a kite about 50 ft. in length, or the number of sections may be more or less to make it longer or shorter. The kite will fold



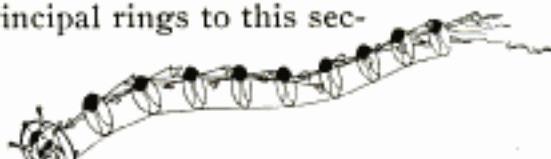
In General Appearance
the Dragon Kite Is Like
a Huge Caterpillar
Floating About in the Air

up into a very small space, for carrying about or for storage, but care should be taken in folding not to entangle the harness.

The Head

The head requires much more work than any of

the other sections. There are two principal rings to this sec-



tion, as shown in Fig. 1. The inner ring is the more important, the outer one being added for the protection of the points when alighting. The construction of the framework is shown in Fig. 2. It is made entirely of bamboo. The bamboo is split into strips, about $\frac{3}{16}$ in. wide, for the ring A. As the bamboo strips will be much too thick, they must be pared down to less than $\frac{1}{16}$ in. The diameter of the ring A is 12 in., and a strip of bamboo to make this ring should be about 38 in. long, so that there will be some end for making a lap joint. The ends of the strip are held securely together by winding them with linen thread. The Chinese boys use strips of rice paper, about $\frac{1}{2}$ in. wide and torn lengthwise of the paper. The rice-paper strips are made wet with paste before winding them on the joint, and when they dry out the shrinkage will bind the ends securely.

Two crosspieces, of the same weight as the ring stick, are placed $3\frac{1}{2}$ in. apart, at equal distances from the center and parallel, as shown at B and C. The ends of these pieces are turned at a sharp angle and lashed to the inside surface of the ring A. To make these bends, heat the bamboo over a candle flame until it will give under pressure, then bend and it will stay in shape after it becomes cold. This method of bending should be remembered, as it is useful in making all kinds of kites. Two



small rings, each $3\frac{1}{2}$ in. in diameter, are put in between the two parallel pieces, as shown at D and E. These are for the eyes of the dragon. The



FIG. 1

The Kite-Head Section, Having Horns, Ears, and Revolving Eyes, Is Very Hideous

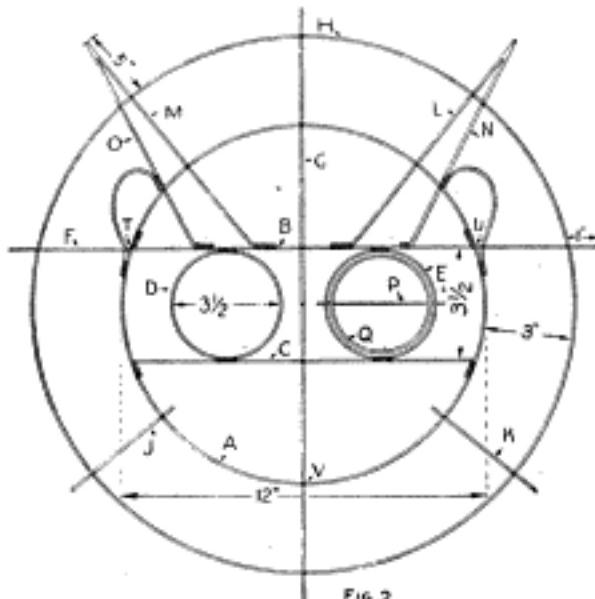
rings are lashed to the two crosspieces B and C. As the eyes revolve in the rings they should be made perfectly true. This can be done by shaping the bamboo about a perfectly round cylinder, $3\frac{1}{2}$ in. in diameter. To stiffen the whole framework, two pieces of bamboo, $\frac{1}{16}$ in. thick, $\frac{1}{8}$ in. wide, and 20 in. long, are lashed to the back as shown by F and G. There is a space of 3 in. between the inner ring A and the outer ring H, giving the latter a diameter of 18 in. It is made of a bamboo strip, $\frac{1}{8}$ in. wide, and should be less than $\frac{1}{16}$ in. thick. It may be necessary to make this large ring from two pieces of bamboo, to get the length, and in such case be careful to make a perfect ring with the ends well lashed together. Two short pieces are lashed to the two rings, as shown at J and K. The supports for the horns consist of two pieces, $\frac{1}{8}$ in. wide and less than $\frac{1}{16}$ in. thick, and they are lashed to the upper crosspiece and to both rings, so that the parts L and M are exactly halfway between the ends of the pieces F and G and radiate out from the center of the ring A, the other parts, N and O,

pointing to the center of the eye rings, respectively. The ears are unimportant and may be put on if desired. The rings on the horns and the stick ends may be from $\frac{1}{2}$ to 2 in. in diameter, cut from stiff paper, but if larger, made of bamboo.

Chinese rice paper is the best material for covering, and it should be stretched tightly so that there will be no buckling or bagging places. The only part covered is that inside of the inner ring A, the horns, and the ears, leaving the eye rings open. The shades are put on with a brush and water colors, leaving the face white, or it can be tinted in brilliant colors. Leave the horns white and color the tongue red.

The Eyes

The frame for each eye is made of bamboo, pared down to $\frac{1}{32}$ in. in thickness and formed into a perfect ring, $3\frac{1}{4}$ in. in diameter. Each ring revolves on an axle made of wire passed through the bamboo exactly on the diameter, as shown at P, Fig. 3. The wire should be long enough to pass through the socket ring D or E, Fig. 2, also, and after the eye ring is in place in the



The Framework for the Head Section is Made Entirely of Bamboo Strips Lashed at the Joints

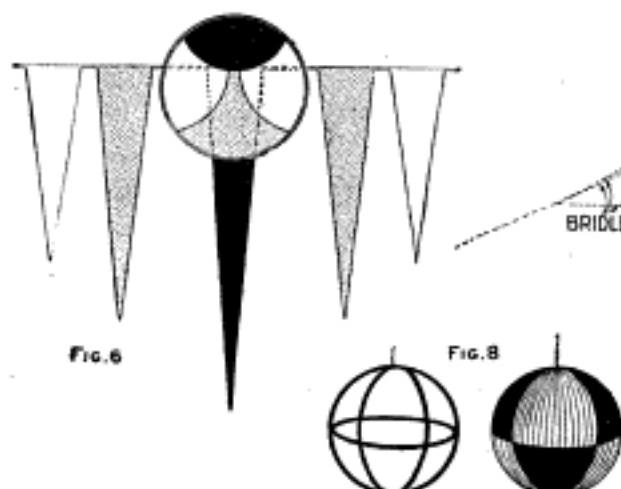
socket ring and the axle adjusted, the latter is fastened to the eye ring with a strip of paper wrapped tightly around the wire and pasted to the bamboo of

the ring. A glass bead, placed on the wire axle between the socket rings D or E and the eye ring Q on each side, keeps them apart and the revolving one from striking the other.

Each side of the eye ring is covered halfway with rice paper, as shown in Fig. 4. The part R is on the upper front half, and that shown by S is on the back lower half. Placing the two halves in this manner causes an unequal pressure of the wind on the whole eyepiece, and thus causes it to revolve on the axle. The front upper half of the eyepiece is made black, and the smaller dark portion extending below the darkened half is a round piece of paper placed just between the two halves so that half of it will show on both front and back of the eyepiece. When the eyepiece is given a half turn in its socket the back side will come to the front and will appear just the same as the other side. Some kite builders add pieces of mirror glass to the eyes, to reflect the light and cause flashes as the eyes revolve in their sockets.

A Section Kite

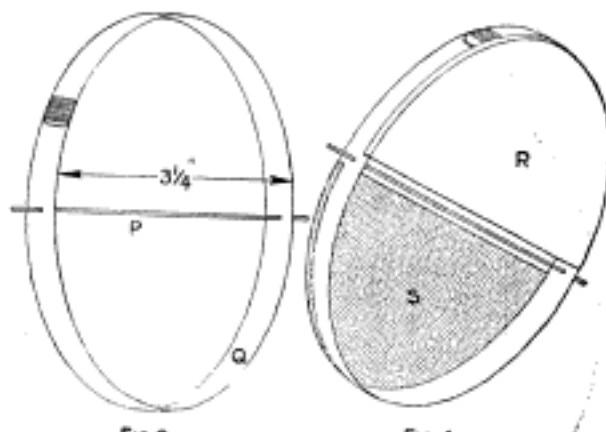
The ring for the section kite is made the same size as the inner ring of the head kite, or in this case 12 in. in diameter. The bamboo for making this ring should be $\frac{1}{8}$ in. wide and $\frac{1}{16}$ in. thick.



The Section Kites Have Balancers and the Disks are Given Bright Colors So That They will Produce the Effect of a Great Dragon When in the Air, the Head Piece Having a Ball Balancer Hanging from the Under Edge

The balancer stick, 36 in. long, is located about the same place as the cross-stick F, as shown in Fig. 2, and must

be made small, light and well balanced. Small tufts of tissue paper, or feathers, are attached to the tip ends of the balancer sticks, as shown in Fig. 5. The

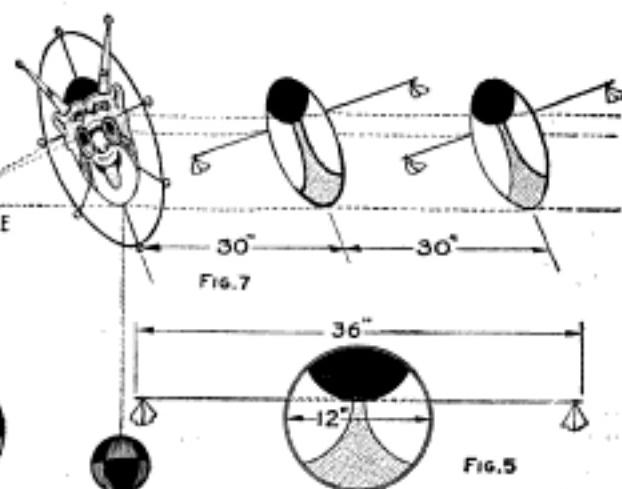


Two Bamboo Rings with Paper Coverings, to Make Them Turn in the Wind, Constitute the Eyes

cover for the section kite is put on tightly, the same as for the head, the colors indicated in the sketch being only suggestions, as the builder can color them as desired. The balancer on the last section should have streamers, as shown in Fig. 6, for a finish. The streamers are made of light cloth.

The Harness

As previously stated, 20, more or less, sections can be used, and the number means so many separate kites which are joined together with three long



cords, spacing the sections 30 in. apart. The cords should be as long as the kite from the head to the tail, allowing suf-

ficient extra length for the knots. As such a kite will make a hard pull, the cord used should be a six-ply, hard-twisted seine twine. Start by tying the three long cords to the head kite at the points T, U, and V, Fig. 2. Tie the next section at corresponding places just 30 in. from the head kite. The construction will be much easier if the head kite is fastened to a wall so that each cord may be drawn out to its proper length. Continue the tying until all sections are attached just 30 in. apart. Other spacing can be used, but the distance selected must be uniform throughout the length of the kite. The individual kites, or sections, may vary in size, or they can all be 9 in. in diameter, instead of 12 in., and the balancer sticks 30 in. long instead of 36 in., but a kite of uniform sections is much better and is easier to make. The positions of the sections as they will appear in the kite are shown in Fig. 7.

The Bridle

The Chinese bridle is usually made of three strings, which are attached to the same points on the head kite as the

harness cords, or at T, U, and V. The lower string is longer than the two upper ones so that the proper inclination will be presented to the breeze. As the head is inclined, all the section kites will also be inclined. Some makers prefer a balancer on the head kite, and in one instance such a balancer was made in the shape of a ball. A ball made of bamboo strips is shown in Fig. 8, and is attached as shown in Fig. 7.

Flying the Kite

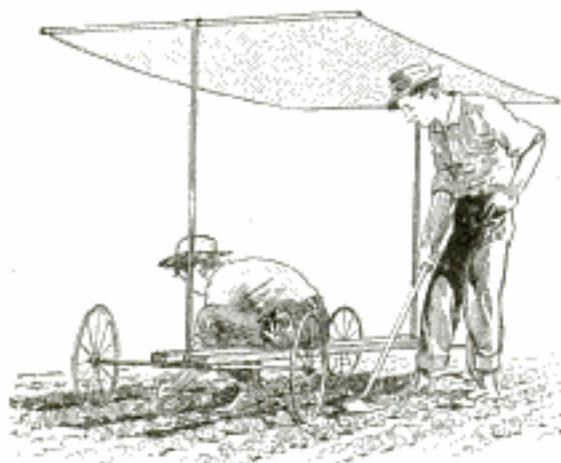
It will be necessary to have a helper, and perhaps two, in starting the kite up, as the harness might become entangled. Quite a little run will be necessary, but when up the kite will make a steady flier and will pull very hard. If the first attempt is unsuccessful, try readjustment of the bridle or a little different position in the breeze, and see that the balancers are not tangled. Quite a number of changes may be worked out on these plans, but it is necessary to bear in mind that the distances between sections must be equal and that the general construction must be maintained.

A Movable Sunshade and Seat for Garden Workers

Weeding gardens under a hot sun and in a necessarily uncomfortable position is by no means a pleasant occupation, but much of the hardship can

be avoided if a combination movable sunshade and seat is made, as shown in the illustration. The framework consists of two end pieces, both made in the same way. Two $\frac{1}{2}$ -in. tees are required for each. These are connected with a 5-ft. pipe, for the upright, and the crosspiece that supports one end of the canvas consists of two pieces of pipe, each about $1\frac{1}{2}$ ft. long, screwed into the tee. The axle for the wheels is also formed of two pieces of pipe, but these are only about 1 ft. long.

Four suitable cart wheels should be provided, or solid circular disks cut out of a board or plank, and drilled for a $\frac{3}{8}$ -in. axle. Ordinary $\frac{3}{8}$ -in. washers are placed on each side of the wheels, one serving as a shoulder on the pipe end, and the other for the nut. The seat can be made of a 1 by 8-in. board, about 6 ft. 9 in. long, notched at each end to fit the pipe tees and prevented from shifting by means of U-bolts



The Sunshade and Seat are Mounted on Wheels So That the Device can be Easily Moved About

around the axle on either side of the upright. After covering the top with canvas, fastened at each end around the upper crosspiece, the shaded movable seat is ready for service.—Contributed by W. E. Crane, Cleveland, Ohio.

To Keep Grass and Weeds Out of Tennis Courts

Tennis courts are very apt to become covered with grass and weeds unless considerable labor is expended on them. The best way to keep a court free from this growth is to put on sheets of tar paper close together when it is not in use. The paper should be cut in strips the proper length, so that they can be rolled up and set aside until the game is over, when they can be laid down again. After the court has been covered a few times, the grass will die out and disappear altogether. The use of salt, acids, and a number of other things, together with hoeing, were tried out, but the paper covering was the most successful of them all.—Contributed by W. D. Mills, Bakersfield, Cal.

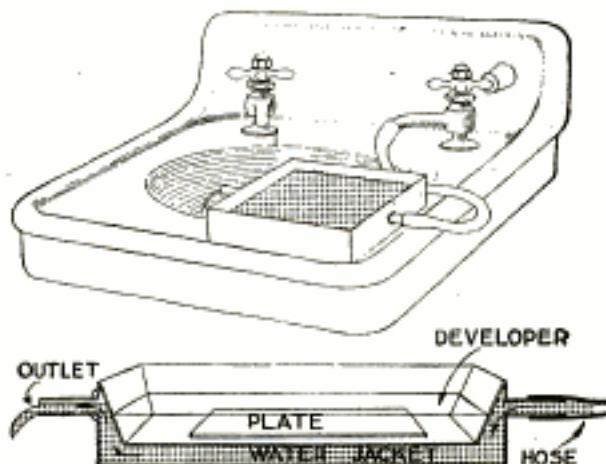
Buttonhole-Bouquet Holder to Keep Cut Flowers Fresh

Being employed near a glass-blowing department I procured a small glass tube and made a buttonhole - bouquet holder. One end of the tube I closed and flared the other, then flattened the whole tube a bit. This tube, inserted in the buttonhole with a few drops of water in it, will keep cut flowers fresh for a whole day. If the upper end is flared just right it will fit the buttonhole and will not be seen, as the tube is hidden beneath the coat lapel.—Contributed by Frank Reid.



Cooler for a Developing Tray

Regardless of the fact that tank development for photography is the better method under most conditions, there



Water-Jacketed Tray for Use in Cooling a Developing Tray with a Flow of Water

are many who take special delight in tray development, because they enjoy seeing the picture as it develops on the plate or film.

There are many of this class of photographers both among amateurs and professionals, and they universally experience much trouble in keeping the solutions cool enough for good work in hot weather or a warm dark room. Many schemes have been used, but there is none simpler than that shown in the illustration. It is certainly better than letting the developing tray float in the bathtub, a common practice among amateurs who are compelled to use the bathroom as a dark room.

Any tinsmith can make a water-jacketed tray of zinc at a nominal price. If one expects to use it for developing films by hand, it should be made relatively deep, or at least shaped so that whatever method is used in manipulating the film will be suited to the size and shape of the tray. I had one made of zinc to accommodate an 8 by 10-in. plate and providing about $\frac{1}{4}$ -in. space all around the sides and bottom of the inner tray for the circulation of the water.

Two brass gas tips were soldered into the ends of the tray and a rubber tube was attached to one of them, as shown.

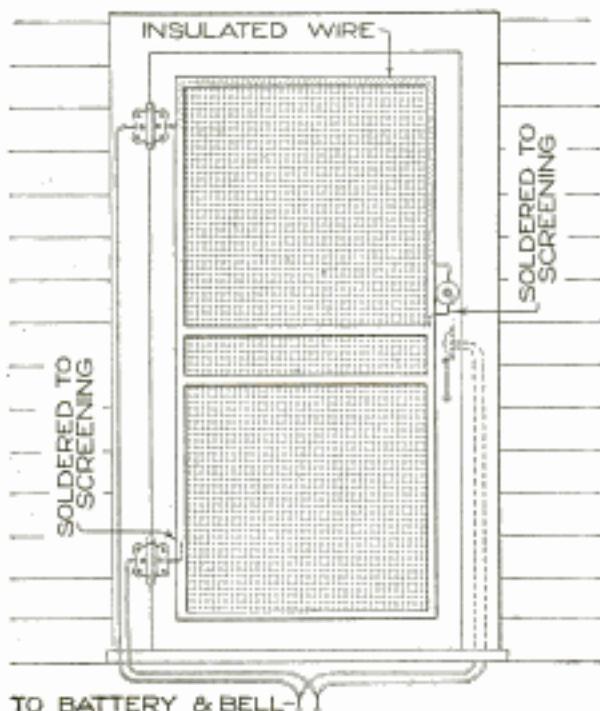
*See Card:
Bouquet holder
29*

By connecting this tray to the bathroom hydrant the developing solution can be kept as cool as desired without slopping water where it is not wanted.—Contributed by T. B. Lambert, Chicago, Ill.

Doorbell Push Button on Screen Door

Push buttons are frequently put in hallways, or other places, not accessible when the screen doors are hooked

the other wire at the top. If the screen is used as conductor, a piece of wire should be connected to it near the bottom, and led through the hinge as before. In either case, after leaving the hinge, the wire must be led and connected to the battery line, to complete the circuit. It is then possible to operate the bell either from outside of the screen door or at the regular place within.—Contributed by E. M. Davis, Philadelphia, Pa.



Method of Connecting a Push Button for a Doorbell on a Screen Door

shut. By connecting an extra button on the screen door with the regular doorbell line, the service can be made to go on uninterrupted whether the screen be locked or open.

To do this, one wire, carefully insulated, from the outside button is laid under the upper molding strip of the screen, as shown, coming out through the hinge and passing down to the battery line, being concealed in any suitable manner, by molding or within the door frame. The button circuit is completed by connecting it to the screen with a short wire, the screen then acting as a conductor. If preferred, the line may be run down under the screen-door molding, and out through the bottom hinge same as with

Working Wood by the Application of Heat

It is often desirable to fit a piece of wood into a piece of metal by means of cutting a thread in the metal and screwing the wood therein. This can be accomplished by heating the metal to a little over the boiling point of water and screwing the wood piece into the metal while hot; or, if this is impractical on account of size, to heat the metal, make a screw plate by cutting a thread in a small piece of metal, the size and thread corresponding to the hole into which the wood piece is to be inserted, and heating it to the required temperature, then running the wood with some pressure through the thread. The wood then can be screwed into the larger piece, where it will hold firmly.

The process of heating wood without the aid of steam can be used to advantage in a number of ways; for instance, a hammer handle that is crooked can be straightened by careful heating without burning; also billiard cues, or almost anything of hard wood. It is surprising how easily it is done and how permanent the repair will be. The Indians at one time made their arrows from small hardwood twigs which were almost always crooked to start with, but after being dried they were warmed over a fire and straightened.

Another use for the application of heat is as follows: When it is desired to place a screw in a fragile piece of wood that is likely to split, if the screw is heated to a blue color and turned

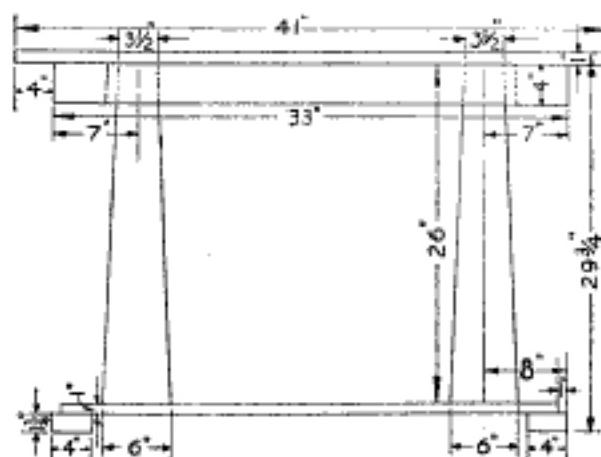
into the wood while hot, there will be scarcely any danger of splitting. In this case do not try to use oil or a lubricant of any kind, as the screw is sure to set before it is in place.—Contributed by James H. Beebe, Rochester, N. Y.

A Parlor Table

The material required for the parlor table illustrated is as follows:

1 table top, 1 by 26 by 41 in.
1 bottom shelf, 1 by 15 by 33 in.
2 side rails, $\frac{3}{4}$ by 4 by 33 in.
2 end rails, $\frac{3}{4}$ by 4 by 21 in.
2 top cross braces, 1 by 4 by 19 $\frac{1}{2}$ in.
4 feet, 1 $\frac{3}{4}$ by 4 by 4 in.
2 posts, 6 by 6 by 26 in.
2 side corner strips, 1 by 1 by 31 $\frac{1}{2}$ in.
2 end corner strips, 1 by 1 by 17 $\frac{1}{2}$ in.

The bottom shelf can be made of two pieces of 1-in. material, 8 in. wide, carefully glued together, and reinforced on the under side with two crosspieces, glued and screwed to it. The foot pieces are secured to the bottom shelf so as to project 1 in. on the ends and sides. In case a center support is deemed advisable, another foot piece can be added, but unless the floor is very level, rocking may result. The uprights, or posts, are made from solid 6 by 6-in. lumber, 26 in. long, carefully squared at the ends, and tapered to 4 in. square at the upper end. If desired, the posts can be made of

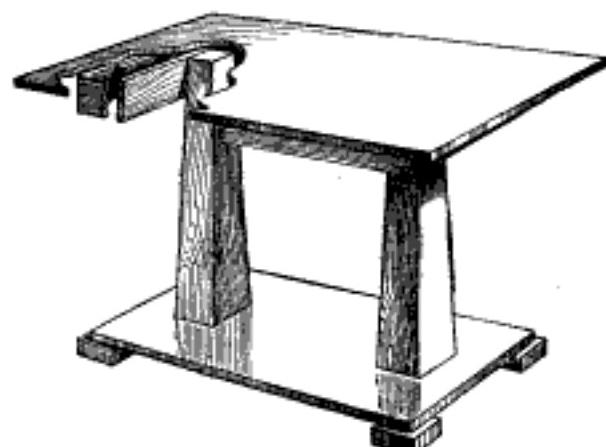


Detail of the Parlor Table, Together with Dimensions of the Pieces

boards, cut and fastened together to form a hollow tapered post. In either case, they should be set in about 4 in.

from each side of the bottom shelf and fastened to it by means of screws.

The rail pieces for the table top



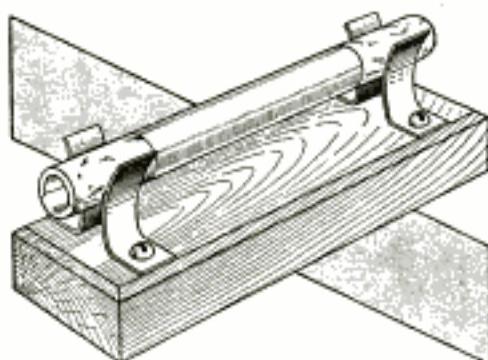
Design of a Table That will Appear Well in the Different Oak Finishes as Well as in Mahogany

should be cut and fitted with mitered joints at the corner to form a rectangular frame, 21 by 33 in. This is glued to the top and may be toenailed to it; but to provide a more secure bracing, a 1-in. square strip of material is fastened all around the inside edge of the rails, flush with their upper edge. The top is screwed to this. In order to prevent tipping when the top is resting on the 4 by 4-in. ends of the posts, two cross braces are provided. These should be screwed to the outer-end sides of the posts, and beveled off on their upper edges to fit the table top. They should be of such length as to have a tight fit between the side rails, and are fastened to these by means of finishing nails driven from the outside. Gluing and toenailing can also be used to secure the top more firmly to the braces; care should be taken that no nails cut through the table top. After thoroughly sandpapering and smoothing off the table, it can be finished to suit.—Contributed by H. J. Blackridge, San Rafael, Cal.

Homemade Fuses for Battery Circuits

To carry out the general arrangement of the regular electrical equipment of a large power plant, the battery circuit should have some sort of a fuse block. An excellent way to

make such a block is as follows: Procure a piece of glass tubing, about 1 in. long, and make a mounting for it with four pieces of sheet brass, as



The Fuse is Well Insulated and Protected against Fire the Same as the Large Fuse

shown in the sketch. The brass pieces are shaped and fastened to a wood base so that their upper ends form a clamp to hold the glass tube.

A very thin piece of tinfoil, about $1\frac{1}{2}$ in. long, is cut $\frac{1}{8}$ in., or less, in width, the size depending on the amount of current used. This is placed in the glass tube and the ends are bent over the edge. A piece of tinfoil is then wrapped around each end, over the ends of the inclosed piece, and pasted to the tube.

The fuse thus made is pushed into the spring clamps of the block which are connected in the circuit.—Contributed by Charles W. Meinberg, Somerville, Mass.

Reproducing Flowers and Leaves in Colors

A very cheap, easy, and quick way to make reproductions of flowers, leaves, insects, butterflies, etc., is the following: Purchase 1 oz. of bichromate of potash and dissolve it in water. Spread this fluid over the surface of the paper upon which the picture is to be made, using a soft brush, and place it in a dark room to dry. When dry it will be a light lemon color.

The leaf, or part to be reproduced, is placed upon the yellow side of the paper and the whole exposed to the sunlight. The uncovered portions will gradually turn brown, while the part

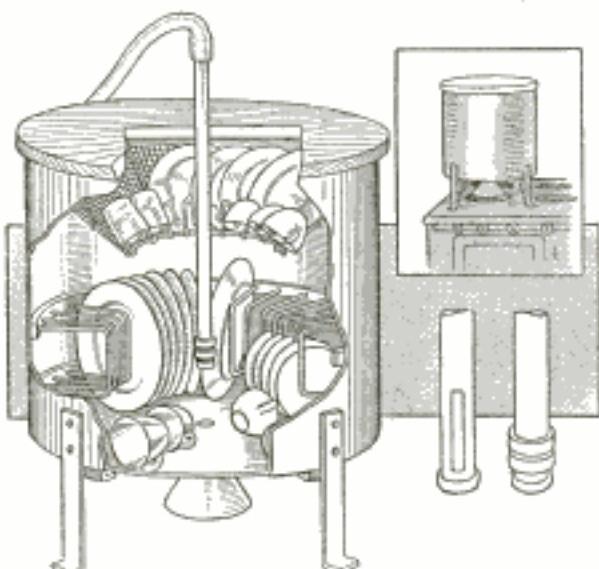
covered by the object will remain a lemon color. When the desired shade of brown is attained, remove the paper from the sunlight, and the image of the object will be on the paper.

Go over the outline with crayons or colors, and fill in the print according to the natural colors. Very beautiful pictures may be made in this way, and a butterfly made up in natural colors on a dark-brown ground is very pretty. These prints, uncolored, will keep for some time, if they are not exposed to a strong light.

Washing as ordinary photographic prints are treated will improve them a little. If the instructions are followed, many beautiful objects can be preserved in color.—Contributed by J. B. Murphy, Plainfield, N. J.

Dishwasher and Drier

Where hot water is available the dishwasher illustrated is especially suitable. It is easily constructed and inexpensive, the only real expense being for the tank, which is 15 in. deep and 20 in. in diameter. A washer of these dimensions will hold the dishes from a table serving six to eight per-



The Hot Water from the Faucet is Forced over the Dishes in a Fine Spray

sons. The tank may be supported on legs if desired.

The supports for holding the dishes

in a vertical position are made of wire in a U-shape, the ends being fastened into two wood hoops that snugly fit the inside of the tank, one near the bottom and the other about 9 in. above the first one. The wires are set about $1\frac{1}{2}$ in. apart and radiate from the center like wire spokes in a wheel.

A funnel-shaped piece, having a hole 5 in. in diameter in the center, is made of mesh wire and hung in place with several wires running to the upper edge of the tank. Hooks are attached to the edge of the hole on which cups and glasses are hung.

The cover consists of a wood disk, with a hole bored in its center for a $\frac{1}{2}$ -in. pipe. The piece of pipe used should be 3 or 4 in. longer than the depth of the tank. A long thread is cut on the lower end of the pipe, and two rectangular holes are cut in the pipe end through the threaded part. These holes are made by cutting through the pipe as if making a slot for a key. Two large nuts are run on the threads of the pipe. These nuts should be thick enough to cover the slot in the pipe. A pipe cap is then screwed on the end of the pipe. The upper end of the pipe is attached to a hose connected to the hot-water faucet. By separating the two nuts just a little, a fine spray of water will be forced out of the holes.

When the dishes are in place the spray of hot water can be directed over them by moving the pipe up and down through the hole in the cover.

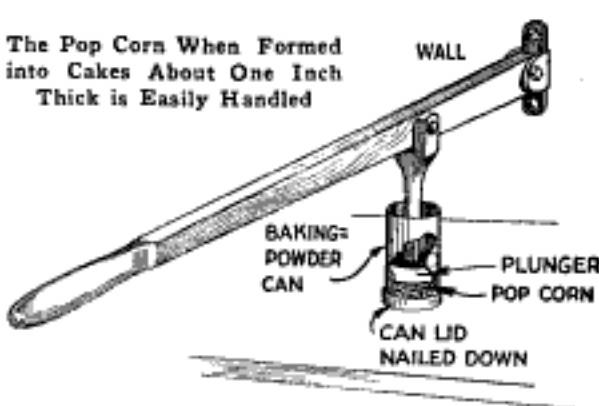
After the dishes are washed sufficiently the hose is removed and the tank placed over a gas jet so that the heat will pass up through the funnel-shaped attachment in the bottom of the tank. The dishes, already heated by the hot water, soon dry in the heat from the gas jet. If desired, the tank can be allowed to remain over the jet until the next meal is ready to serve, using a very small flame.—Contributed by W. K. Baxter, Massillon, O.

To empty a large sack filled with heavy material, turn or roll it over a barrel.

How to Make Pop-Corn Cakes

It is very difficult to take a bite from a ball of pop corn, and it becomes more difficult as the ball increases in size.

The Pop Corn When Formed into Cakes About One Inch Thick is Easily Handled



As a large number of balls were required for a church entertainment I decided to make the pop corn into cakes. This was more easily accomplished than first imagined with the use of a cake-forming device as shown in the illustration. The body of the former was made of a baking-powder can with the bottom removed. The cover of the can was nailed to the top of an old table with its flange upward. A plunger of wood was made to fit snugly inside of the can and a lever, about 3 ft. long, attached to it and fulcrumed to the wall.

After the pop corn has been prepared with the sirup, it is placed in the can and compressed. The can is then lifted out of the cover and the pop-corn cake removed. This method offers a much better way to serve pop corn than in balls. In making the cakes, the can, cover, and plunger must be kept well covered with butter.—Contributed by Howard A. Hopkins, Youngstown, New York.

Threading a Darning Needle

Having occasion to use a darning needle, the eye of which was too small to insert the yarn in the usual manner, I tried the following method with good results. A thread was doubled and passed through the eye, and the loop thus formed was used to pull the yarn through.—Contributed by Joe Henderson, Eldred, Ill.

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POPULAR MECHANICS

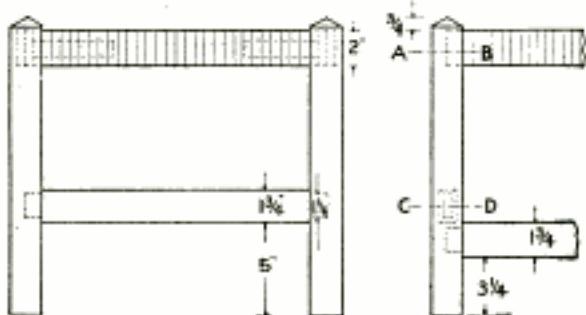
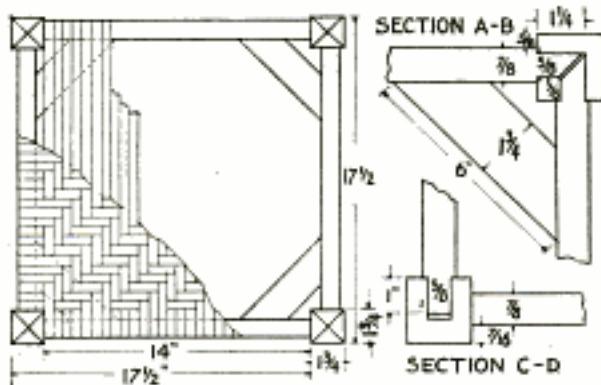
Woven-Top Stool

The material necessary for this stool is as follows:

4 legs, $1\frac{3}{4}$ by $1\frac{3}{4}$ by 16 in.
 4 bottom rails, $\frac{3}{8}$ by $1\frac{3}{4}$ by 16 in.
 4 top rails, $\frac{3}{8}$ by 2 by $16\frac{1}{2}$ in.
 4 diagonal braces, $\frac{3}{8}$ by $1\frac{3}{4}$ by 6 in.



Weaving the Top of the Stool by Using a Wet Weaver of Reed



Construction of the Frame and Manner of Laying the Weavers for the Top

The legs are mortised so the top rails come level. The upper rails are tenoned on the sides only and beveled at the ends. For the bottom rails, the mortises are made one above the other, the rails being tenoned on all sides. The braces are cut at 45° on each end and glued into place.

In weaving the top, proceed as follows: Use a wet weaver and wrap one layer over the entire top, the strips being placed close together and tightly wound. Start the second layer at right angles to the first by going under one strip, then over three strips, under three, and so on, by threes, until that strip is finished. Start the second by going under two strips, then over three, under three, and so on, as before. The third strip should start by going under three, then over and under three, etc. Start the fourth by going over one, then under three, and over three, as in the preceding; the fifth, start over two, then under and over three, repeatedly. The sixth, and last of the series, begin over three and then continue, by threes, as before. Having finished one series, the remainder of the top should be completed in similar order. Good white shellac makes the best finish for the seat; the stool itself may be finished to suit.—Contributed by Russel Dodsworth, Erie, Pa.

Preserving Shafting from Rust and Corrosion

In a laboratory it was very difficult to keep the line shaft and countershafts bright and free from rust, owing to the fumes and gases issuing from the several fume closets within the same room. The following method was tried, and proved very satisfactory. The shafting was covered with two coats of flat white paint and allowed to dry, after which a coat of white enamel was applied, giving it a clean, glossy, and sanitary appearance. This eliminated all the trouble of cleaning it with emery cloth, and it also made it appear in harmony with the other furnishings of the laboratory.—Contributed by Geo. F. Stark, Norwich, N. Y.

Fishing-Rod Making and Angling

By STILLMAN TAYLOR

PART III—Trout Fishing with Fly and Bait



If He would Take Full Advantage of Any Sport and Reap the Greatest Pleasure from a Day Spent in the Open, the Sportsman should Get Together a Good Outfit

THE art of angling is generally viewed as one of the world's greatest recreations, and while each and every phase of fishing may be said to possess certain charms of its own, fly fishing for trout is regarded by most well-informed sportsmen as the alpha and omega of the angler's art. This is so because the trout family are uncommonly wary and game fish, and the tackle used for their capture is of finer balance and less clumsy than any employed in angling for the coarser game fishes. If he would take full advantage of any sport and reap the greatest pleasure from a day spent in the open, it is really necessary for the sportsman to get together a good outfit. It is not essential to have a very expensive one, but it should be good of its kind, well proportioned for the purpose for which it is to be used. The beginner, who buys without good knowl-

edge of the articles required, or fails to use careful discrimination, is almost certain to accumulate a varied assortment of junk, attractive enough in appearance, perhaps, but well-nigh useless when it is tested out on the stream. A good representative outfit, then, is of the first importance; it means making a good beginning by initiating the novice in the sport under the most favorable conditions. Let us then consider the selection of a good fishing kit, a well-balanced rod, the kind of a reel to use with it, the right sort of a line, flies, and the other few items found in the kit of the practical and experienced trout fisherman.

Selecting a Good Fly Rod

The ordinary fishing pole may be bought offhand at almost any hardware store, but a well-balanced rod for fly fishing should be well tested out beforehand. The requirements call for a rod of comparatively light weight, a rod that is elastic and resilient, and yet strong enough to prove durable under the continued strain of much

fishing. If the angler has made his own rod, as suggested in former chapters, he will have a good dependable fly rod, but the large majority of anglers who are about to purchase their first fishing kit should carefully consider the selection of the rod. At the outset it must be understood that good tackle is simply a matter of price, the finest rods and reels are necessarily high in price, and the same thing may be said of lines and flies. Providing the angler has no objection to paying \$15, or more, for a rod, the choice will naturally fall upon the handmade split bamboo. For this amount of money a fair quality fly rod may be purchased, the finer split bamboos costing anywhere up to \$50, but under \$15 it is very doubtful whether the angler can procure a built-up rod that is in every way satisfactory. The question may arise, Is a split-bamboo rod necessary? The writer's own long experience says that it is not, and that a finely made solid-wood rod, of greenheart or dагame, is quite as satisfactory in the hands of the average angler as the most expensive split bamboo. A good rod of this sort may be had for \$10, and with reasonable care ought to last a lifetime.

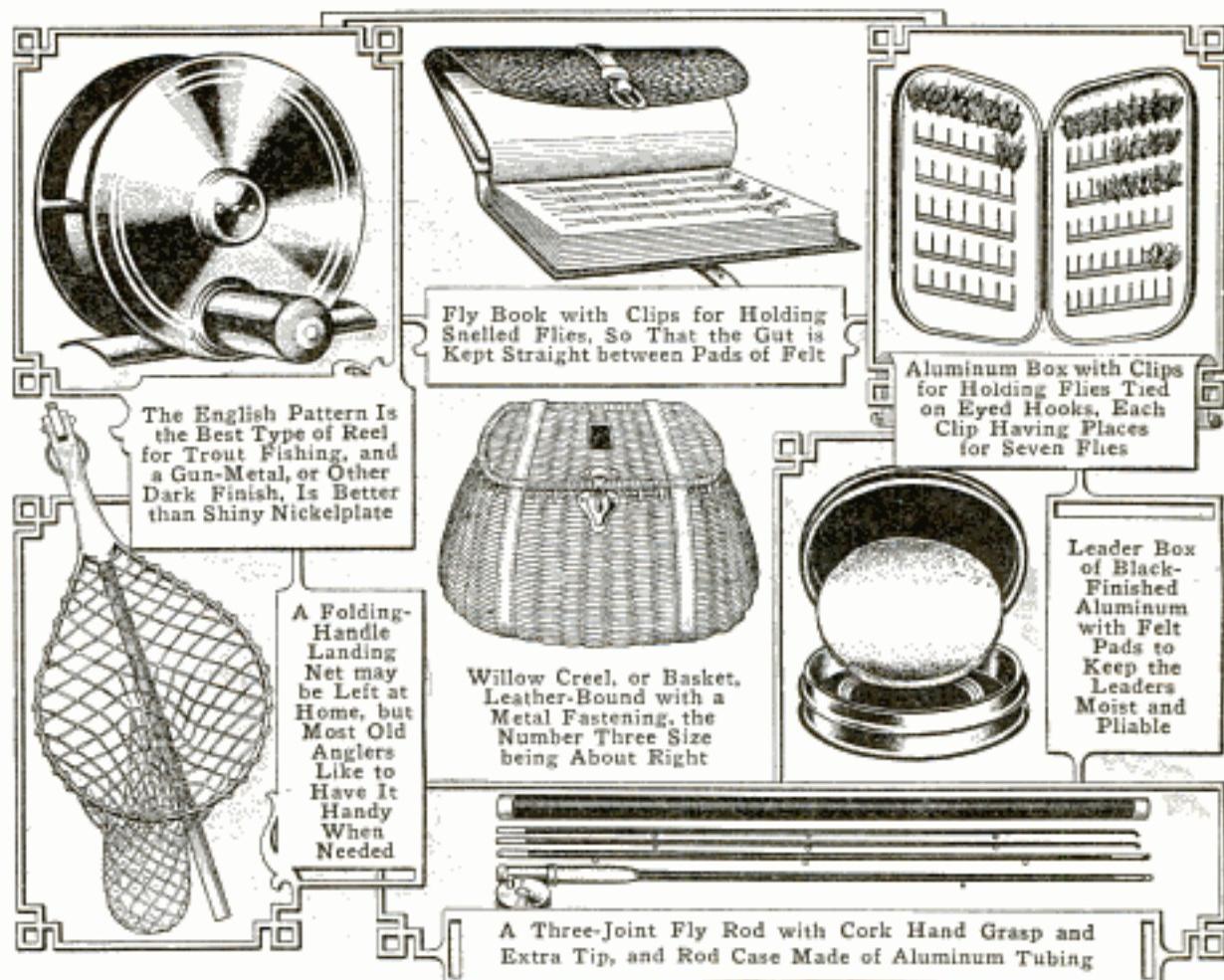
The points to look for in a fly rod, whether the material is split bamboo or solid wood, is an even taper from the butt to the tip; that is, the rod should register a uniform curve, or arc, the entire length. For general fly casting 9 ft. is a handy length, and a rod of $6\frac{1}{2}$ oz. weight will prove more durable than a lighter tool. A good elastic rod is wanted for fly casting, but a too willowy or whippy action had best be avoided. However, for small-brook fishing, where the overgrown banks prohibit long casts, a somewhat shorter and stiffer rod will be more useful. For casting in large northern streams, where the current is swift and the trout run to a larger size, a $9\frac{1}{2}$ or 10-ft. rod of 8 oz. weight is often preferred. Of course, the veteran angler can safely use a much lighter rod than the beginner, and one occasionally meets a man on the stream that

uses a 5-oz. rod for pretty heavy fishing. To be on the safe side, the novice will make no mistake in choosing a rod of fair length and conservative weight.

When selecting a rod in the tackle shop, do not rest content with a mere examination of the appearance, but have the dealer affix a reel of the weight and size intended to be used with it. By reeling on a short length of line and reeving it through the guides and then fastening the end to a weight lying upon the floor, a very good idea of the rod's behavior may be gained, since by reeling in the line and putting tension on the rod its elasticity and curve may be seen and felt as well as in actual fishing. To give the utmost satisfaction, the rod should fit its owner, and several rods should be tried until one is found that most fully meets the angler's idea of what a rod should be. If one happens to have a good fly reel, by all means take it along and attach it to the rod while making the tests. It is practically impossible to gauge the balance of a rod without affixing the reel, and many a finely balanced tool will appear badly balanced until the proper-weight reel is affixed to it.

The Proper Kind of Reel

For fly fishing nothing is so good as the English style of click reel, which is made with a one-piece revolving side plate and with the handle affixed directly to it. Any kind of a balanced-handle reel is an out-and-out nuisance on the fly rod, because it has no advantage in quickly recovering the line, and the projecting handle is forever catching the line while casting. In fly casting, the length of cast is regulated by the amount of line taken from the reel before the cast is made, and it is while "pumping" this slack line through the guides, in making the actual cast, that the balanced or projecting handle is very apt to foul the line. A good reel that is smooth-running like a watch will cost about \$10, but a very good one may be had for \$5, and cheaper ones, while not so durable, may be



used with fair satisfaction. The heavier multiplying reels, so essential for bait casting from a free reel, are altogether unsuited for the fly rod, being too heavy when placed below the hand, which is the only proper position for the reel when fly casting. The single-action click reel, having a comparatively large diameter, but being quite narrow between the plates, is the one to use, and hard rubber, or vulcanite, is a good material for the side plates, while the trimmings may be of german silver or aluminum. The all-metal reel is of about equal merit, but whatever the material, the most useful size is one holding about 40 yd. of No. E size waterproof line. A reel of this capacity will measure about 3 in. in diameter and have a width of about $\frac{7}{8}$ in. between plates. A narrow-spooled reel of this type enables the fisherman to reel in the line plenty fast enough. Owing to the fact that the reel is placed below the grip on fly

rods, a rather light-weight instrument is needed to balance the rod. Of the two extremes, it is better to err on the side of lightness, because a heavy reel makes a butt-heavy rod and, throwing extra weight on the wrist and arm, makes casting increasingly difficult after an hour's fishing. An old hand at the game will appreciate this point better than the novice.

The Kind of Line to Use

The fly-casting line used by a veteran is generally of silk, enameled and having a double taper; that is, the line is thickest in the center and gradually tapers to a smaller diameter at each end. Single-tapered lines are likewise extensively used, and while they cost less, they are tapered at one end only and cannot be reversed to equalize the wear caused by casting. The level line, which has the same diameter throughout its entire length, is the line most generally used, but the cast

cannot be so delicately made with it. For the beginner, however, the level line in size No. E is a good choice. For small-brook fishing, No. F is plenty large enough. In choosing the size of line, there is a common-sense rule among fly casters to select a line proportioned to the weight of the rod. For a light rod a light line is the rule, and for the heavier rod a stouter line is the logical choice. If the rod is of a too stiff action, use a comparatively heavy line, and it will limber up considerably; if the rod is extremely "whippy," use the lightest line that can be purchased, and used with safety.

A Fine Leader Marks the Expert Caster

The leader for trout is preferably of single gut, and as fine as the angler's skill will allow. The fly caster's rule is to use a leader whose breaking strain is less than the line, then, when the tackle parts, it is simply a question of putting on a new leader and the more expensive line is saved. Ready-made leaders may be purchased, or the angler can tie them up as desired. For length, a 3 or 3½-ft. leader is about right for average fishing. Longer leaders are used, and while they sometimes are of advantage, the 3-ft. length is more useful. A longer leader is awkward to handle because the loop is apt to catch in the top of the rod when reeling in the line to bring the fish close to the landing net. Leaders may be had with a loop at each end, or with loops tied in, for using a cast of two or three flies. For all average casting, the two-fly cast is the best, but the expert angler uses the single-fly very often. For lake fishing, the single large fly is generally preferred. For using two flies, the leader is provided with three loops, one at the top, another at the bottom, and an extra loop tied in about 15 in. from the lower loop. In fly casting, the first, or upper, fly is known as the "dropper," and the lower one as the "tail" fly. For the single-fly cast but two loops are required.

Gut used for leaders should be carefully selected, and only those lengths which are of uniform diameter and

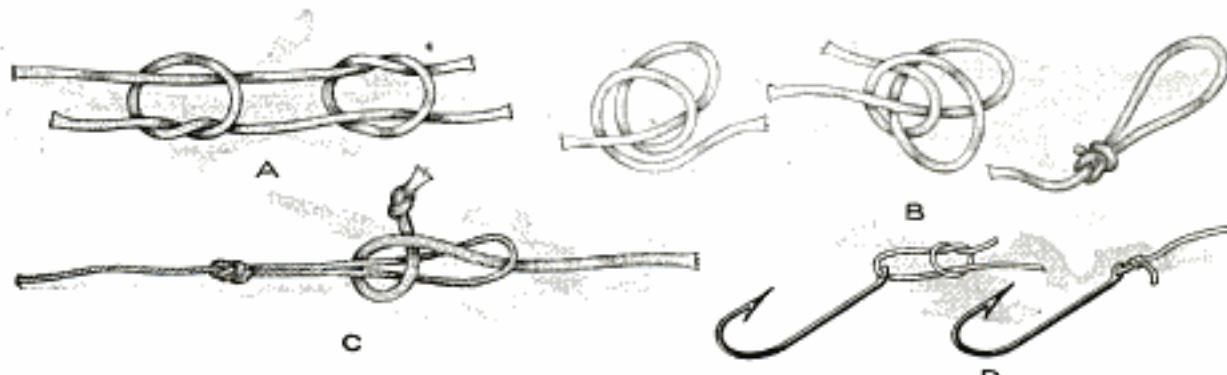
well rounded chosen, the lengths which show flat and rough spots being discarded. Dry gut that is very brittle should be handled very little, and previous to a day's fishing the leaders must be soaked in water over night to make them pliable, then coiled in between felt pads of the leader box to keep them in fishing shape. After use, put the frayed leaders aside and dry them out between the flannel leaves of the fly book.

Gut is the product of the silkworm, and the best quality is imported from Spain. It comes in bundles, or hanks, of 1,000 strands, 10 to 20 in. long and in different thicknesses, or strengths. The heaviest are known as "Royal" and "Imperial," for salmon; "Marana," for extra-heavy bass; "Padron," for bass; "Regular," for heavy trout; "Fina," for light trout, and "Refina," for extra-light trout. The grades "Fina" and "Refina" are well suited for all average fly fishing, while the heavier sizes are useful for heavy large fishing.

To make the leaders, soak the strands of gut in warm water over night until they are soft and pliable. Select the strands for each leader of the desired thickness and length so that the finished leader will have a slight taper to one end only. By using the "Fina" gut for the upper length and tying in two lengths of "Refina" gut, a nicely tapered leader of light weight is obtained. Begin the leader by uniting the strands together to make it the correct length, three 12-in. strands being about right for average casting. The "single water knot" is the strongest and neatest to use. Make it by taking the thick end of the strand and doubling it back enough to tie in a common knot just large enough for the line to pass through and drawing it up tightly. Tie a single loose knot in the other end of the strand, about $\frac{1}{8}$ in. in diameter and close to the end; take the next thickest strand of gut, thread the thicker end through the loose knot and tie a second square knot around the strand, as shown at A. By pulling on the two

long ends the loops can be drawn up tightly, and the two knots will slide together and make a neat and very strong knot. Repeat this operation

well-known "angler's knot" is mostly used. This knot is shown at C. The snelled fly is attached by passing the loop over the loop of the leader and



The Single Water Knot Used in Tying Leaders; a Good Knot for Making the Loop at the End of the Leaders; an Angler's Knot Used for Attaching the Line to the Leader, and a Jam Knot for Attaching Eyed Flies, or Hooks, to the Leader or Snell

until as many strands of gut are knotted together as required to make the leader of the desired length. For making the loop at the ends, a double-bighted knot, tied as shown at B, is used. If a dropper fly is desired, do not pull the water knot tightly, but first insert a short length of gut with a common knot at the end and a loop in the other, then draw the water knot up tightly, and a short snell will be made for attaching the fly as usually.

Flies for Trout Fishing

The standard selection of artificial flies numbers about 60, but the average fisherman will find about 24 selected patterns to answer every need. For making up the most "killing" flies for the trout season, the following can be recommended: Use red ibis, stone fly, cinnamon, red spinner, and parchment belle, for April; turkey brown, yellow dun, iron blue, spinner, montreal and red fox, for May; spider, black gnat, silver doctor, gray drake, orange dun, and green drake, for June; July dun, grizzly king, pale evening dun, red ant, and brown palmer, for July; Seth green, coachman, shad, governor, August dun, and royal coachman, for August, and black palmer, willow, whirling dun, queen of the water, and blue bottle, for September.

To attach a line to the leader the

inserting the fly through the leader loop. When eyed flies are used they are often attached direct to the leader, or a looped snell may be used as in the ordinary American-tied fly. To attach the eyed fly direct to the leader, the common "jam knot," shown at D, is mostly used, and when the slipknot is drawn up tightly and the extra end cut off it makes a small, neat knot, not apt to slip.

Catch to Hold Two Joining Doors Open

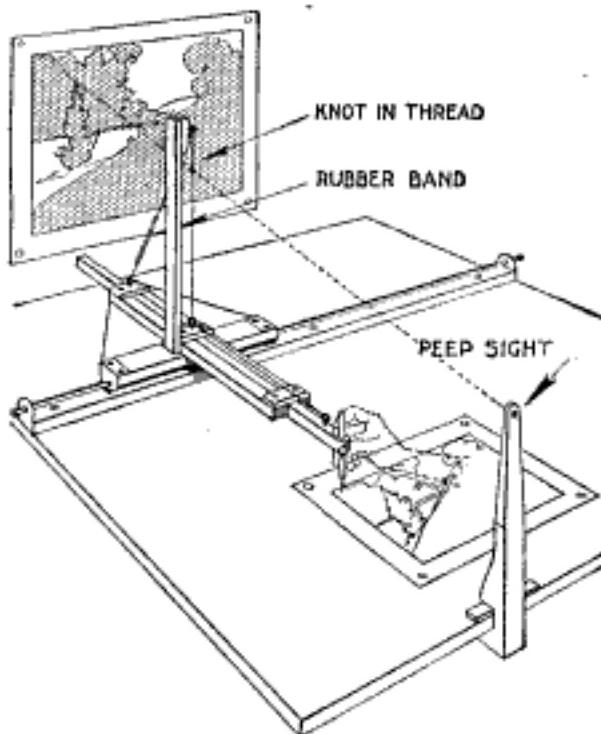
Where two open doors meet, a catch to keep them open can be made of a piece of wire, shaped as shown. The hooks at the ends of the wire are slipped over the shanks of the knobs.—Contributed by W. A. Saul, Lexington, Mass.



Strips cut from wood dishes used by grocers for butter, thoroughly soaked in warm water, will make excellent repair pieces for market baskets.

Machine for Sketching Pictures

An ordinary drawing board, with the attachments shown, provides an easy way to sketch pictures, even if



This Machine Aids a Person in Drawing the True Outline of a Picture

one is not proficient in this line of work. It is only necessary to look through the sight and move the pencil about so that the knot in the thread follows the outline of the landscape or object being drawn.

The size of the machine depends on the one building it, but a fair-sized drawing board is sufficient for the beginner. A strip of wood is fastened to the board, near one edge, which has a metal piece on each end, fastened to the under side and bent up over the end to form an extension for the rod to support the moving parts. The strip of wood should be $\frac{3}{4}$ in. wide and $\frac{1}{4}$ in. thick, and the sliding arm, holding the pencil, $\frac{1}{2}$ in. wide and $\frac{1}{4}$ in. thick. A like strip, but much shorter than the one fastened to the board, is also fitted with metal pieces in an inverted position so the projections will be downward. A $\frac{3}{16}$ -in. rod is run through holes in the metal pieces of the strips at both ends, and

soldered to those on the strip fastened to the board. This will make a hinged joint, as well as one that will allow the upper strip to slide horizontally.

Centrally located on the upper strip are two more strips, fastened with screws at right angles to the former, with a space between them of $\frac{1}{2}$ in. for the sliding center piece holding the pencil. These pieces are further braced with a wire at the back, and crosspieces are screwed both on top and under side, to make a rigid guide for the sliding pencil holder. An upright is fastened to the side of one of these pieces over the center of the upper horizontal sliding piece for a screw eye to hold the thread. Another screw eye is turned into the crosspiece just under the one on the support, so that the thread will run perpendicularly between them. Two more screw eyes are fastened, one into the upper surface of the rear crosspiece, and the other in the end of the pencil holder, near the pencil. By connecting these screw eyes, as shown, with a thread, having a rubber band fastened in the rear end and a knot tied in it near the screw eye in the upper end of the vertical stick, a means for following the outlines of the picture is provided.

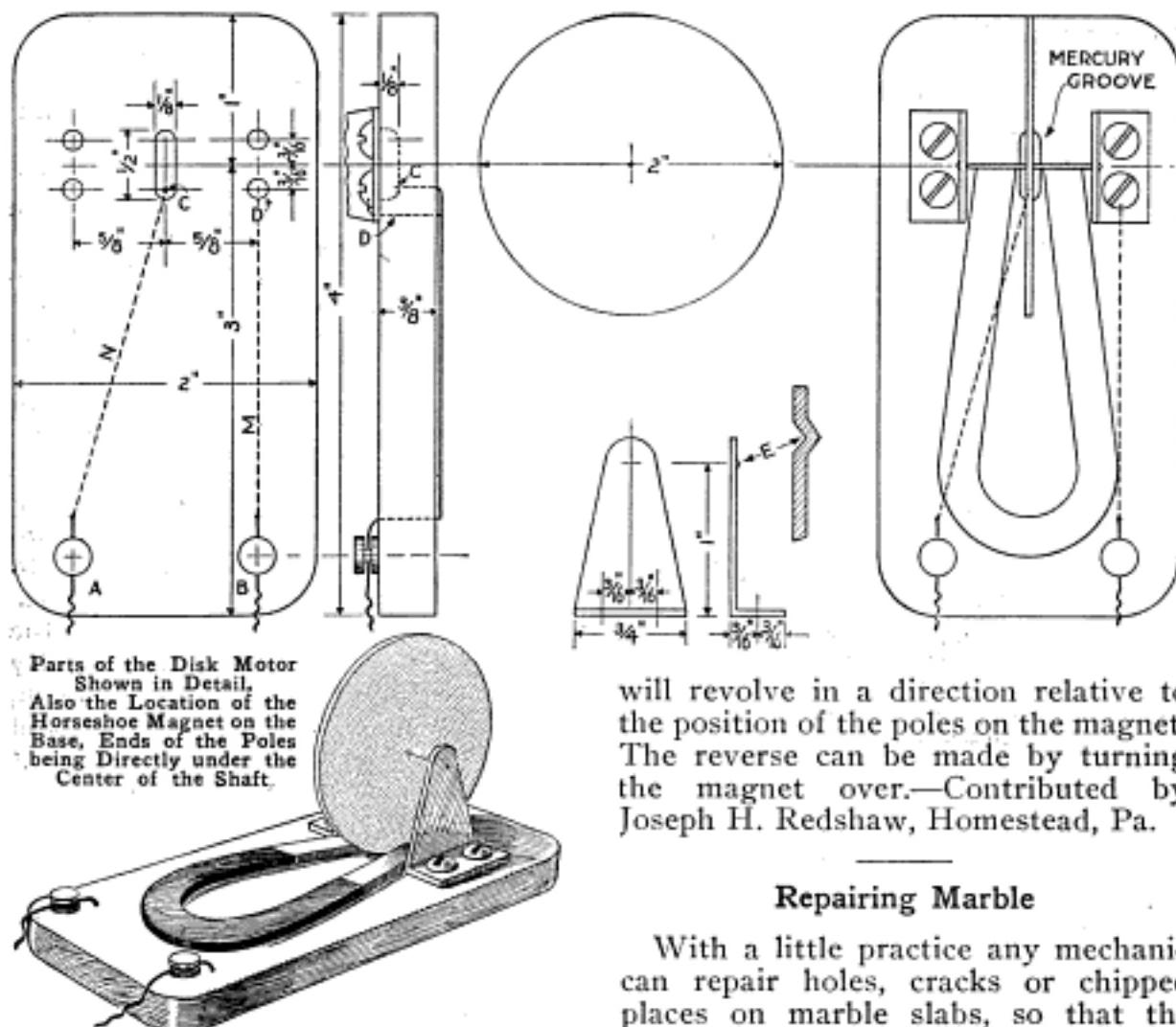
A vertical stick is fastened to the front edge of the board by means of a notch and wedge. In the upper end of this stick a very small hole is bored for a sight, similar to a peep sight on a rifle.

To use the machine, set the board on a table, or tripod, and level it up in front of the object to be drawn. Look through the sight at the front of the board and move the pencil about to keep the knot of the thread on the outlines of the picture to be drawn.—Contributed by Wm. C. Coppess, Union City, Ind.

CA walnut filler is made of 3 lb. burnt Turkey umber, 1 lb. of burnt Italian sienna, both ground in oil, then mixed to a paste with 1 qt. of turpentine and 1 pt. of japan drier.

A Disk-Armature Motor

One of the simplest motors to make is the disk motor, its construction requiring a wood base, a brass disk, a 3-in. horseshoe magnet, and some mercury.



The base is made of hard wood, in the proportions shown in the sketch. The leading-in wires are connected to the binding posts A and B; and from these connections are made, on the bottom of the base, from A to the groove C cut in the upper surface of the base for the mercury, and from B to one screw, D, of one bearing. The end of the former wire must be clean and project into the end of the groove, where it will be surrounded with mercury.

The bearings consist of thin sheet brass, cut to the dimensions shown, the bearing part being made with a well-pointed center punch, as at E. The disk wheel is made of sheet brass, 2 in.

in diameter, and a needle, with the eye broken off and pointed, is used for the shaft. The needle shaft can be placed in position by springing the bearings apart at the top.

When the current is applied, the disk

will revolve in a direction relative to the position of the poles on the magnet. The reverse can be made by turning the magnet over.—Contributed by Joseph H. Redshaw, Homestead, Pa.

Repairing Marble

With a little practice any mechanic can repair holes, cracks or chipped places on marble slabs, so that the patched place cannot be detected from the natural marble. Use the following mixture as a base for the filler: Water glass, 10 parts; calcined magnesite, 2 parts, and powdered marble, 4 parts. These should be mixed thoroughly to a semifluid paste. Fill the crack or hole and smooth off level, then with a camel's-hair brush and colors, made of aniline in alcohol, work out the veins, body colors, etc., as near to the natural marble as possible. It will depend on the application of the colors whether the repair can be seen or not. Artificial-marble slabs can be formed from this mixture.—Contributed by A. E. Soderlund, New York City.

POPULAR MECHANICS

INTERESTING NEW PATENTS

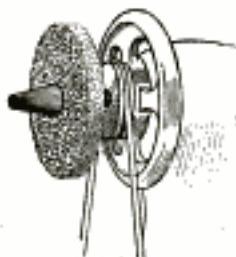


FIG. 1

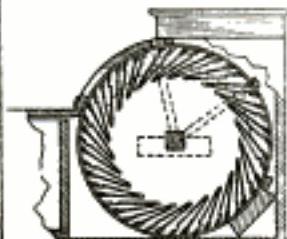


FIG. 2



FIG. 3



FIG. 4

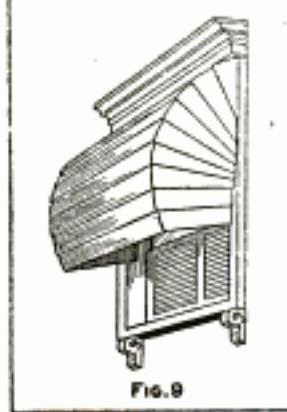


FIG. 5

GRINDING ATTACHMENT FOR SEWING MACHINES (Fig. 1)—The grinding disk is mounted on a screw that fits into the screw hole ordinarily occupied by the nut used for locking the flywheel and belt wheel to the shaft. A cone-shaped steel shaft projects outward from the center of the disk, and the taper of the shaft is such that, with the blade of a pair of scissors laid flat on the shaft, the edge is ground to the right angle. The edge of the disk is used for grinding of any kind.

SEMAPHORE FOR RURAL MAIL BOX (Fig. 2)—When the semaphore arm is raised to a horizontal position it is a signal that mail has been left in the box. The arm is connected by a series of levers to an inverted-U-shaped trigger which stands upright when the arm is in the lowered position. When the wheel of the carrier's wagon passes over this trigger the arm is raised to the horizontal position and remains in that position until it is reset.

FILING CABINET (Fig. 3)—This cabinet has the form of a drum and is mounted on a horizontal shaft. The ends of the drum are closed, while the periphery consists of a series of longitudinal strips on which are mounted filing pockets, as shown. Access to the pockets is through an opening near the top of the casing in which the drum revolves.

NOVEL STEERING GEAR FOR MOTOR VEHICLE (Fig. 4)—With this apparatus both the front and rear wheels are turned in steering the vehicle. Steering bars run from the ends of the axles to pivots that slide in slots in a horizontal plate at the middle of the chassis. These pivoted ends are cross-connected by links that are pivoted at their intersection, as shown, while a bell crank controlled by the steering column is pivoted to this intersection. The whole link mechanism is pushed or pulled to one side by the bell crank, and the axles are swung by the sliding of the steering-bar ends along the slots.

PROPELLER FOR TURNING SHIP (Fig. 5; British patent)—The propeller is driven by a belt and is carried on a frame that is pivoted to the stem of the ship, so that the propeller can be lowered into the water or raised clear as required. The force is exerted athwartships, the propeller being intended for use in turning the ship.

MULTIPLE-WING AEROPLANE (Fig. 6)—Increased sustaining power and stability are evidently the ends sought in this curious arrangement of planes. The planes are flexible and are so connected that they are always warped simultaneously and in the same direction.

POISON BOTTLE (Fig. 7; British patent to an American)—An elongated opening passes through the bottle midway between the top and bottom, leaving curved triangular sections at the sides. The purpose is to make the bottle of such distinctive shape that its character will be detected the instant it is picked up.

SUPPORT FOR FRUIT-LADEN TREE (Fig. 8)—This support consists simply of a netting of coarse weave drawn around the tree so that it takes the outward thrust of the branches. The netting has a joint extending from top to bottom and is held in place by lacing or clamping the edges together.

TELESCOPING AWNING (Fig. 9)—This awning consists of a set of telescoping sections pivoted to a common center in the window frame. When folded back the awning is concealed in the window recess.

WHEEL WITH FLAT TREADS (Fig. 10)—The wheel is entirely inclosed by links which are shaped to fit over the rim, and at each of the connections between links a flat tread is pivoted. The whole device is so adjusted that at any time three of the treads will lie flat on the ground under the wheel.

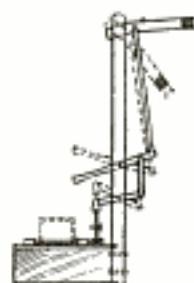


FIG. 8



FIG. 9

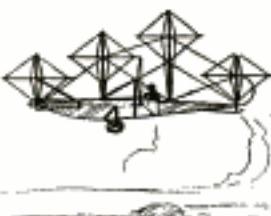


FIG. 10



FIG. 11



FIG. 12

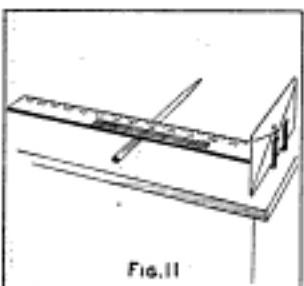


Fig. 11



Fig. 13

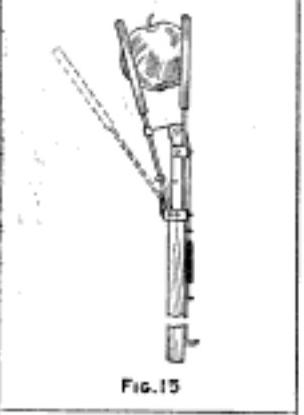


Fig. 15

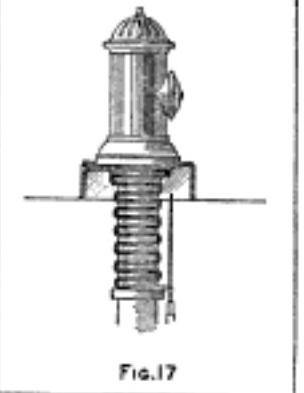


Fig. 17

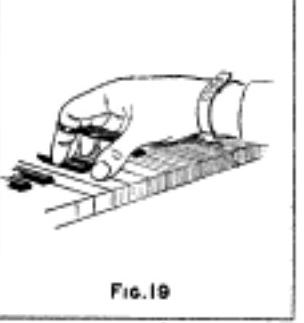


Fig. 19

COMBINED RULER AND POSTAL SCALE (Fig. 11)—This simple device is made to be used both as a ruler and as a weighing beam for postal matter. One end is equipped with clips for holding an envelope vertically, and one side is marked with a scale of postal charges. In using, the letter is placed in the clips and the ruler is balanced on a pencil. The scale reading at the point above the pencil gives the amount of postage required.

APPARATUS FOR PROTECTING FRUIT TREES FROM FROST (Fig. 12)—The essential feature of this invention is a fabric cover closing a ring that is suspended over the tree and a curtain that is supported by this ring and hangs around and incloses the tree. It can be used in connection with an orchard heater of any type. When not in use the curtain is drawn up and fastened to the ring.

FAN ATTACHMENT FOR LAWN SWINGS (Fig. 13)—Fans are fixed to the bottom of a shaft which is journaled in the top of the swinging frame so that the fans hang directly over the seat. The top of the shaft has a crank arm which is connected by a rod with the rigid supporting frame, and as the seat is swung, the fans are also swung and rotated.

CALENDAR WATCH FOB (Fig. 14; design patent)—Inside the ornamental cover is a rotatable disk around the edge of which are marked the days of the month. A section of the cover, long enough to expose seven numbers, is cut away, and along the edge of this section the seven days of the week are marked. The disk is set from week to week so that the days of the month and of the week will correspond.

FRUIT PICKER (Fig. 15; British patent)—The fixed and movable jaw each consists of a wire loop shaped to engage the fruit. The movable jaw is pulled against the fruit by a cord that extends down the pole and terminates in a handle. When the handle is released the cord is pulled up by a spring and the movable jaw swings outward under its own weight.

SHOCK ABSORBER (Fig. 16)—This device consists of a cylinder in which a hollow, elongated piston works, and both the cylinder and the piston contain liquid. In the lower face of the piston is a valve that retards the passage of the liquid in one direction, but permits it to flow freely in the other direction. In the piston are baffles and at the top are air vents. The idea of the invention is to absorb the shock by retarding the flow of the liquid and air and, therefore, the motion of the piston.

STEAM-JACKETED FIRE HYDRANT (Fig. 17)—The hydrant is equipped with a system of steam coils passing around the base. In case the hydrant is found to be frozen, the inlet and outlet are connected with the fire engine, and steam is passed through the coils.

ICE-MOBILE OPERATED BY HAND (Fig. 18)—At the sides of the sled are toothed wheels that work on one shaft and are set so that they bear against the ice. The sled is propelled by these wheels by means of a handle bar that is connected by a rod with a crank arm on the shaft.

FINGER TRAINER FOR PIANISTS (Fig. 19)—This device is designed to hold the fingers in the correct position as they strike the piano keys. It consists of a wrist band to which elastic bands, one for each finger, are attached. The finger bands can be varied for length, and the loops can be adjusted for fitting the fingers.

BLOWER ATTACHMENT FOR HANSAW (Fig. 20; American patent to a Canadian)—This device consists of a bulb attachment designed for blowing the sawdust away from the saw cut. The bulb is of rubber and is placed in a recess in the handle so that it is conveniently pressed by the hand. A tapering stem projects downward from the bulb and the bottom of this stem is curved so that a blast of air will be thrown forward along the line of the saw blade.



Fig. 12

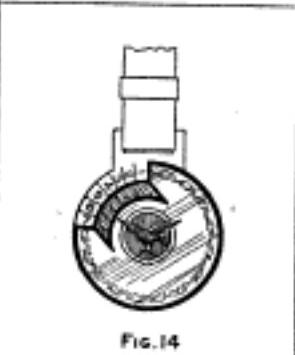


Fig. 14

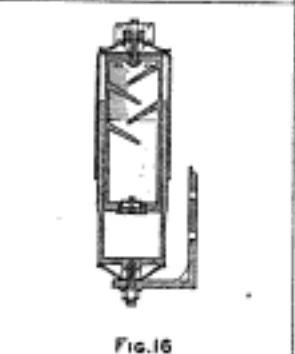


Fig. 16



Fig. 18

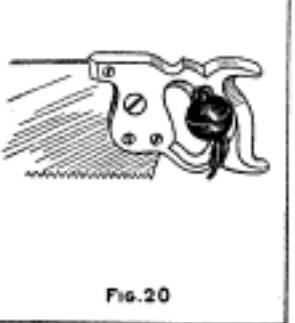
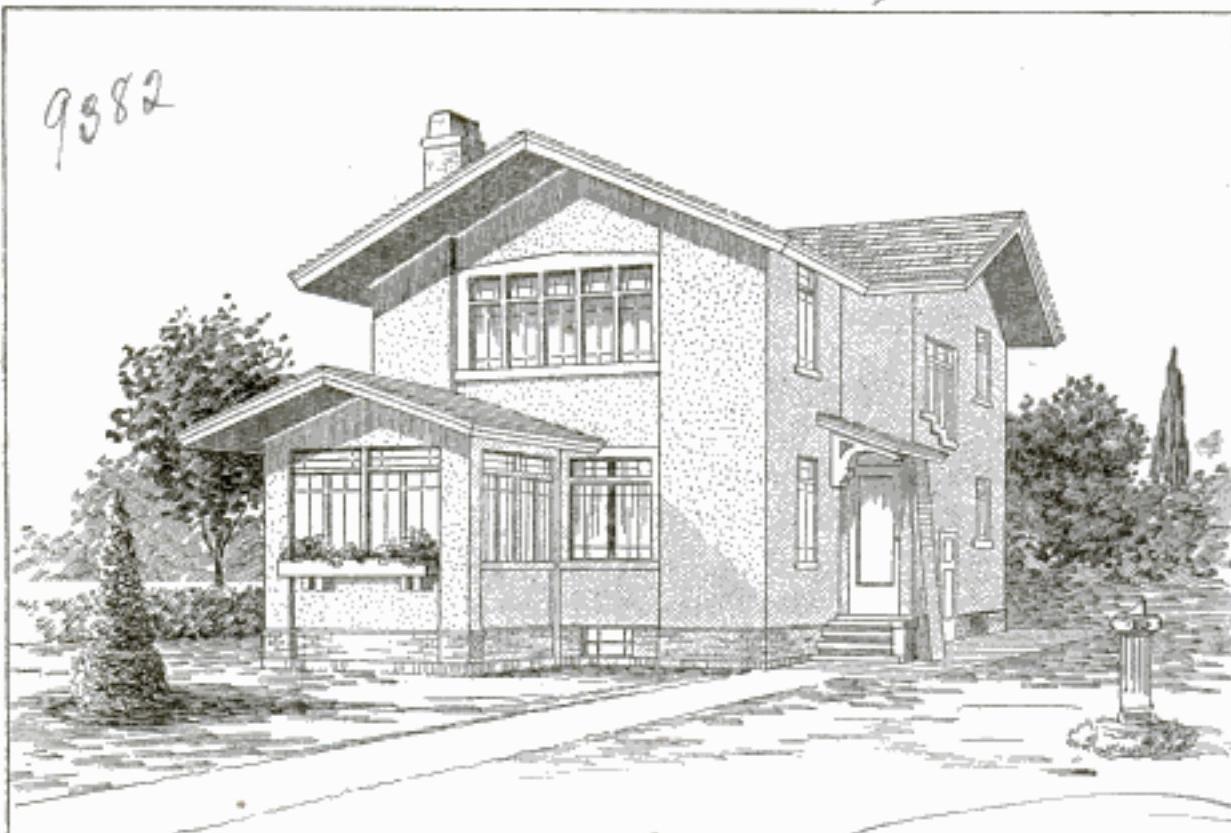


Fig. 20

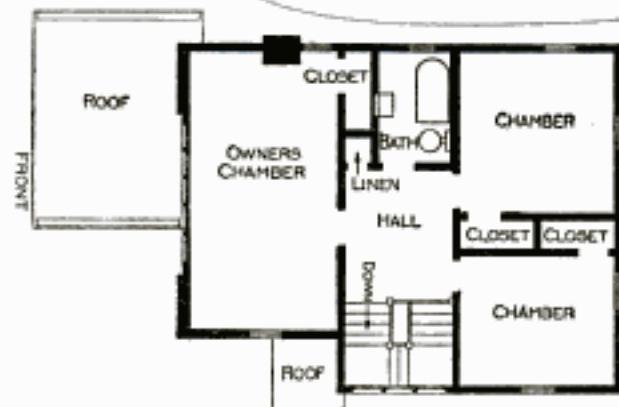
AN ATTRACTIVE SEVEN-ROOM STUCCO COTTAGE



M. L. KEITH, ARCHITECT, MINNEAPOLIS, MINN.



First-Floor Plan

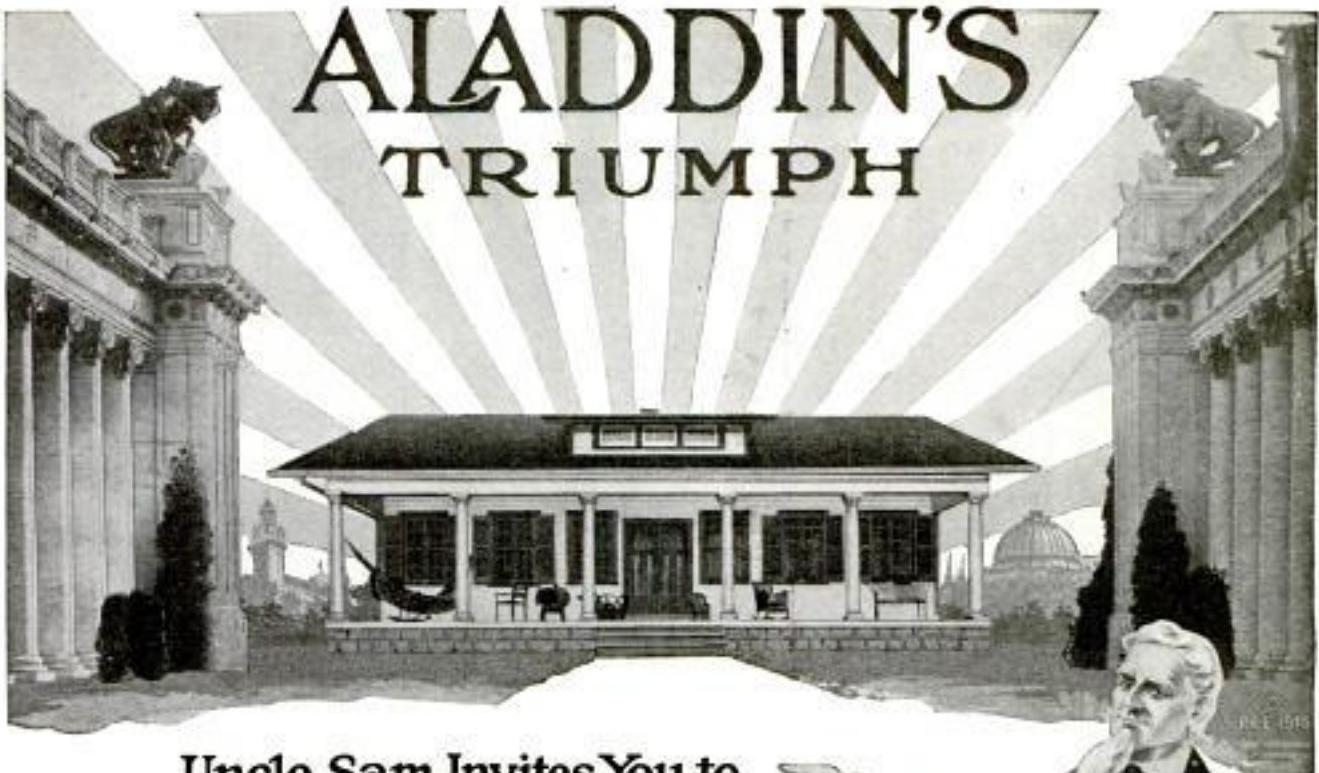


Second-Floor Plan

THIS stucco cottage is interesting both for the simplicity and effectiveness of the exterior treatment and for the novel way in which the floor space is utilized. The front entrance, which is placed at the side of the building and is given little prominence as an exterior feature, opens into a small reception hall, and from this there is direct access to the living room, kitchen, and second floor. The living room extends entirely across the building and has a massive fireplace at one end. The living room and dining room have beamed ceilings. At the front of the building is the sun room. This is one of the features emphasized in the exterior treatment, which is practically free from ornament. The cottage is a frame structure having exterior walls of cement stucco laid on metal lath. The foundations are of concrete below the grade line, and of brick above this line, while the roof is of stained shingles. The building is estimated to cost about \$3,700 under ordinary market conditions.

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Aladdin houses and the Aladdin Readi-Cut system of construction have thus scored an imperishable triumph — have taken the leading place in this the greatest exposition of modern scientific, commercial and industrial accomplishments.

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You can buy all the material needed to build a cozy, 5-room house complete for \$298. Everything included to finish the house, ready to occupy. Price includes the same high grades of material that are used in the larger Aladdin houses. The Aladdin system makes it possible for you to own your home at a great saving. Houses from \$138 to \$5000 are pictured and described in the Aladdin catalog. Send for your copy today.

Sovereign Summer Cottages



Enjoy the pleasures and advantages of summer cottage life — spend this summer in a Sovereign summer cottage. Sovereign summer cottages are complete. Price includes all material necessary for completion. All material being cut to fit, you can erect one in a few days, yourself, and save the cost of skilled labor. A number of designs to select from — a complete summer cottage for \$144. Ask about it today.

Dollar-a-Knot Guaranteed

Aladdin houses are complete. Aladdin prices include sills, joists, studding, cut to fit; building paper; subfloor, rafters, cut to fit; outside finish, flooring, hinges, paints, oils, with complete drawings, illustrations and instructions for erection — THE COMPLETE HOUSE.

The big Aladdin Catalog No. 180 tells all the interesting facts

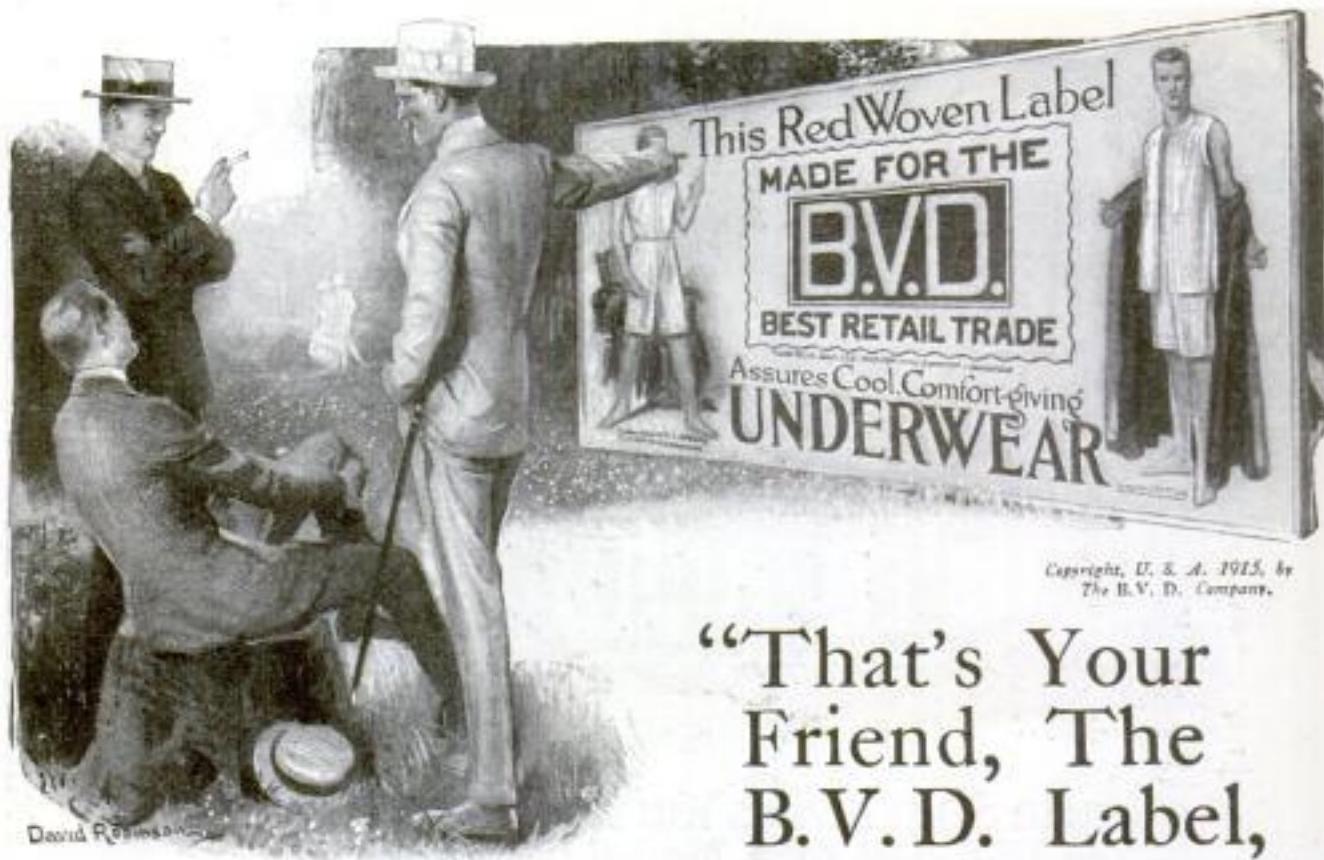


North American Construction Co.

Mills in Michigan, Florida, Louisiana and Oregon

963 Aladdin Avenue

BAY CITY, MICH.



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“That’s Your Friend, The B. V. D. Label, Boys!”

“TAKE a mental snapshot of that *Red Woven Label*, Tom, and you won’t be fooled as I’ve been once. Now, they can’t sell *me* anything but B. V. D. Underwear. I’m just as particular about my *underclothes* as I am about my outer clothes.”

“I prefer B. V. D. because it feels so soft and fits so good. Take my word for it, it’s certainly cool and comfortable, washes up like new and gives me no end of wear. I don’t buy, if the B. V. D. Red Woven Label is missing.”

On every B. V. D. Undergarment is sewed This Red Woven Label

B. V. D. Union Suits (Pat. U.S.A. 4-30-07) \$1.00, \$1.50, \$2.00, \$3.00 and \$5.00 the Suit.



B. V. D. Coat Cut Undershirts and Knee Length Drawers, 50c., 75c., \$1.00 and \$1.50 the Garment.

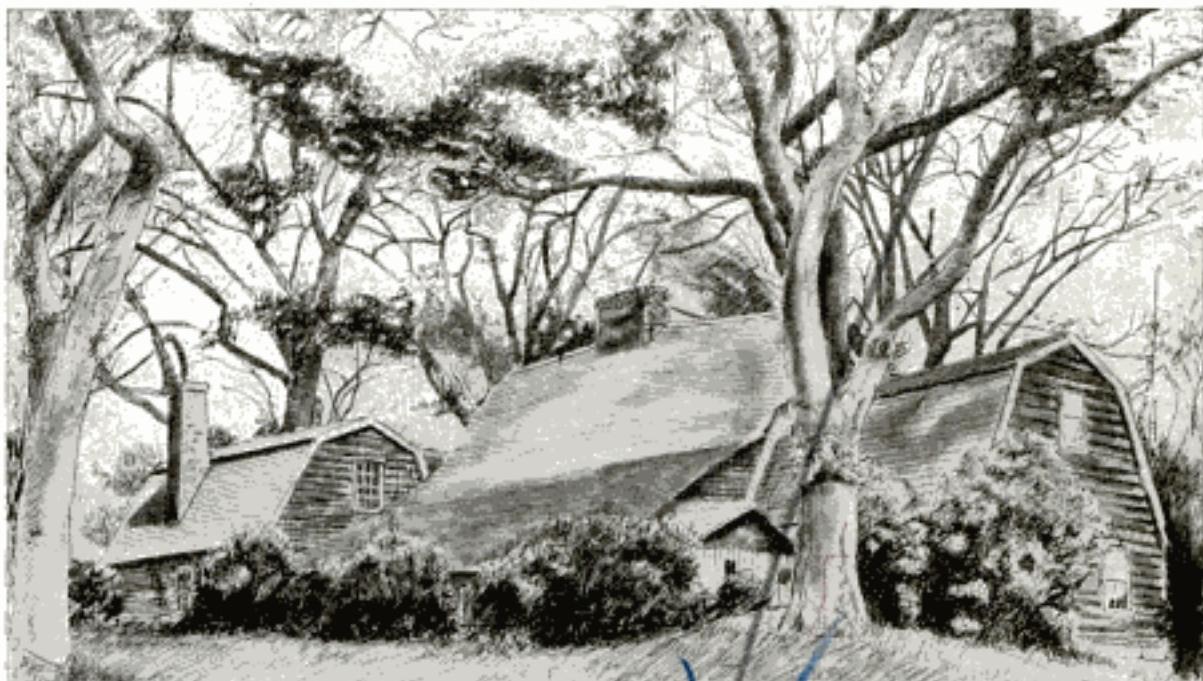
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The B. V. D. Company, New York.

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The Fairbanks House at Dedham, Mass.
Built in 1636. Excepting the shell and
adobe houses of Florida and California,
the oldest house now standing in America.

279 Years Old—and Still a Comfortable Home

For nearly three centuries this unpainted house has stood exposed to the weather. Continuously occupied and still almost perfectly preserved, it offers the most convincing proof of the enduring qualities of

WHITE PINE

Ever since the Pilgrims landed, White Pine has been universally recognized as the wood preferred above all others in home-building. And figuring value in terms of service, it is the most economical.

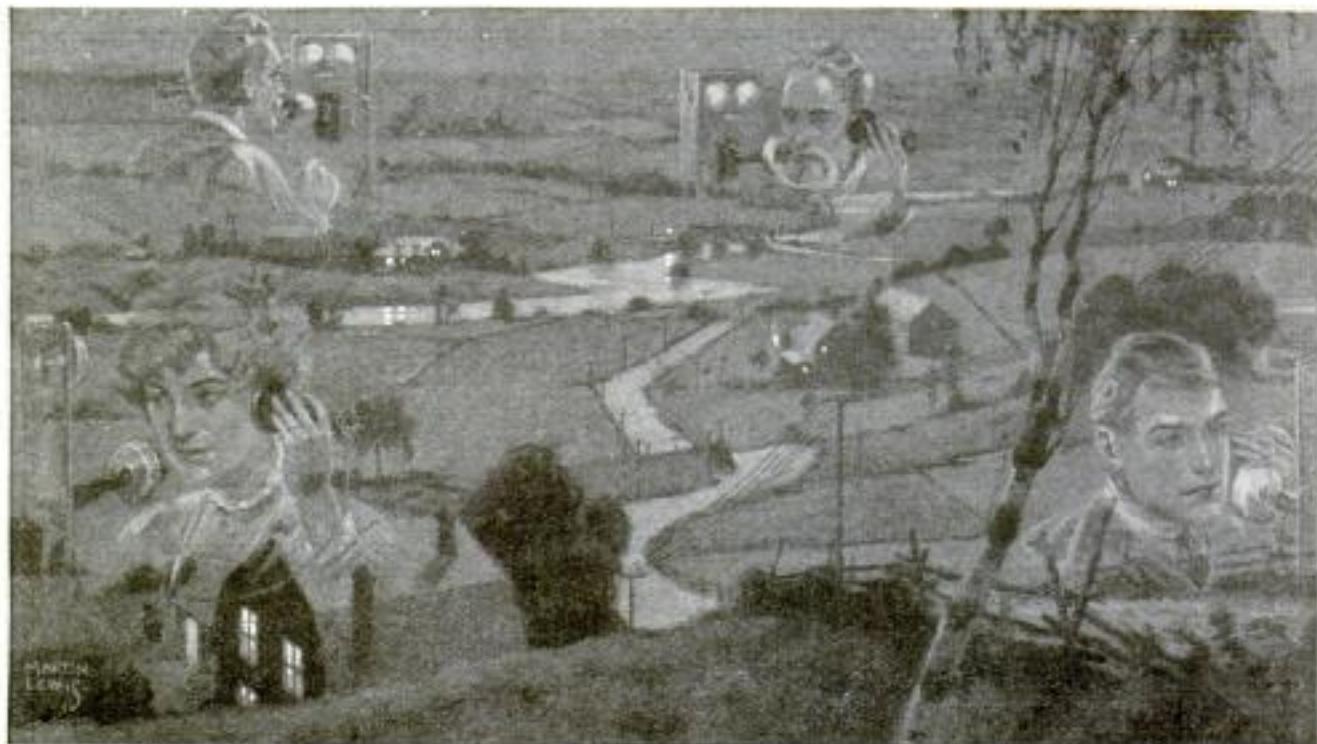
Despite an impression of its scarcity, White Pine is still abundantly available today, as it always has been, in any quantity desired. If your lumber dealer is unable to supply it, we would appreciate the opportunity of being helpful to you in securing it.

Send today for our free booklet, "WHITE PINE IN HOME BUILDING." It is beautifully illustrated, and gives much interesting and practical information regarding this most remarkable wood. If you contemplate building, please send us the name of your lumber dealer when writing for booklet.

*Address, WHITE PINE BUREAU,
1526 Merchants Bank Building, St. Paul, Minn.*

Representing:

The Northern Pine Manufacturers Association
of Minnesota, Wisconsin and Michigan, and The
Associated White Pine Manufacturers of Idaho



Neighborizing the Farmer

One of the most significant facts of our telephone progress is that one-fourth of the 9,000,000 telephones in the Bell System are rural.

In the days when the telephone was merely a "city convenience," the farms of the country were so many separated units, far removed from the centers of population, and isolated by distance and lack of facilities for communication.

But, as the telephone reached out beyond cities and towns, it completely transformed farm life. It created new rural neighborhoods here, there and everywhere.

Stretching to the farthest corners of the states, it brought the remotest villages and isolated places into direct contact with the larger communities.

Today, the American farmer enjoys the same facilities for instant, direct

communication as the city dweller. Though distances between farms are reckoned in miles as the crow flies, the telephone brings every one as close as next door. Though it be half a day's journey to the village, the farmer is but a telephone call away.

Aside from its neighborhood value, the telephone keeps the farmer in touch with the city and abreast of the times.

The Bell System has always recognized rural telephone development as an essential factor of Universal Service. It has co-operated with the farmer to achieve this aim.

The result is that the Bell System reaches more places than there are post offices and includes as many rural telephones as there are telephones of all kinds in Great Britain, France and Germany combined.



**AMERICAN TELEPHONE AND TELEGRAPH COMPANY
AND ASSOCIATED COMPANIES**

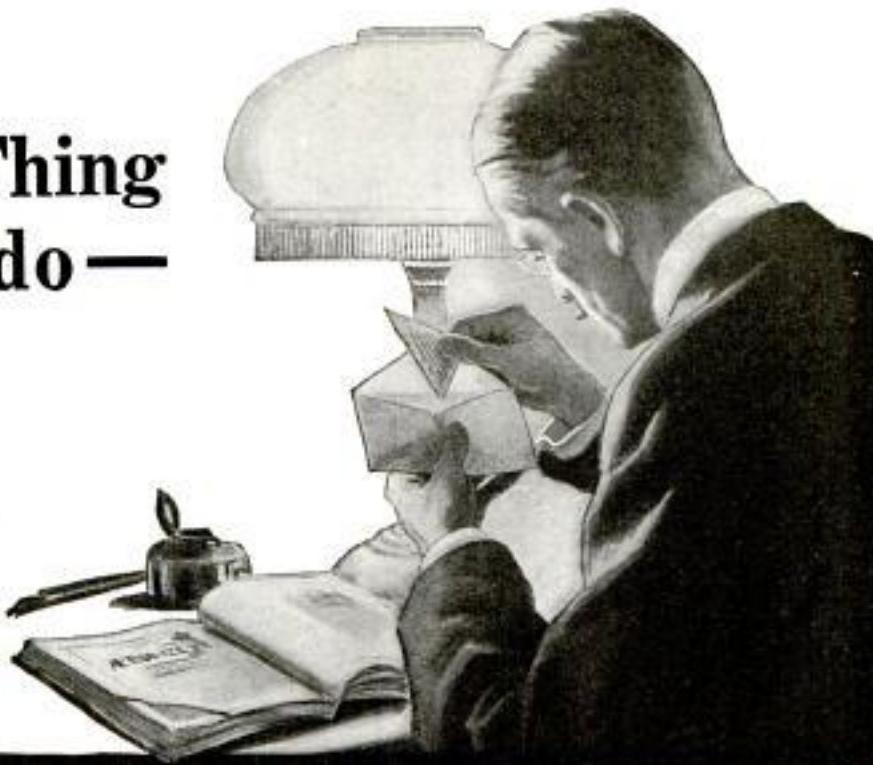
One Policy

One System

Universal Service

The Next Important Thing for You to do—

*Mail
this Coupon
Today*



DON'T wait for accident or sickness to come to you. One man in seven was killed or injured last year by accident. Many thousands of our policy-holders were laid up by illness. Don't take chances. Look out now while you can. Make things easier for yourself and yours when the accident or sickness does come. Read this letter from a woman in Ohio—"I don't know what I would have done if my husband had not carried your policy. It is all I have to raise the children on while he is sick. I have seven—the oldest only 15." How about *your* wife?



AETNA-IZE



A sudden attack of typhoid—an ulcerated throat—a quick gripe followed by pneumonia—an operation for appendicitis—you don't know when you are going to be sick. As for accidents, consider the manager of the department store in Atlanta who was so badly hurt by a flying nail—or the girl in Dallas, Texas, whose clothing

caught fire from the exhaust of a motorcycle motor—or the man in Providence, R. I., who was injured by a passing lunatic. These are not exceptions. We note such things every day as the demands for weekly indemnities come in. Things that seem absurd but they may put a man in bed for six months.

Protect Yourself With An Accumulative Disability Policy

If you are totally disabled by any ordinary accident, we will pay you \$25 a week as long as you live, or \$50 a week if you are disabled by a railway, steamship, elevator or burning building accident. And if you are sick with any illness that confines you to the house we will pay you \$25 a week for a year. If you are killed, your wife will get from \$5,000 to \$15,000. If

you lose two limbs or both eyes we will pay you \$5,000 to \$15,000. Half as much for one hand, foot or eye.

Send the coupon. It costs nothing and brings the whole story.

AETNA LIFE INSURANCE COMPANY

Drawer 1341

HARTFORD, CONN.

The largest company in the world writing Life, Accident, Health and Liability Insurance

Agency opportunities for all Casualty and Bonding lines

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AETNA LIFE
Drawer 1341
I have marked the kinds of insurance
I wish to know about: Accident
Health Disability My age
Life Certificate Is years, I am
in good health,
PM 5-15

EVINRUDE + ROWBOAT = MOTORBOAT

EVINRUDE

Detachable Rowboat
and Canoe Motor



28

IN THE GOOD OLD SUMMER TIME THE BOY WITH AN EVINRUDE IS "IT"!

Unless you already own one you have no idea of the fun you and your friends can have with an Evinrude Detachable Rowboat Motor.

You start off for a day's outing and take your Evinrude along. Arrived at your destination—lake, river or seashore—you clamp the Evinrude to the stern of **any** rowboat (the work of a moment), give the flywheel a quarter turn and you are off!

The Evinrude drives an ordinary rowboat at the rate of 7 to 8 miles an hour

—a canoe 10 to 12 miles an hour—and runs four hours on less than a gallon of gasoline. If you own an Evinrude all the pleasures of motor boating are yours **without the expense**.

The 1915 model has Waterproof Magneto built into the flywheel (no separate battery required)—Automatic Reverse, enabling you to "back water" instantly by merely giving the tiller handle a twist—and Maxim Silencer, making the motor almost noiseless in operation.

Illustrated catalog and name of Evinrude dealer in your town on request. Just say—"Mail me a copy of your catalog and tell me where I can see an Evinrude."

EVINRUDE MOTOR CO., 31 Evinrude Block, Milwaukee, Wis., U.S.A.

Distributing Branches:—69 Cortlandt St., New York, N.Y.—218 State St., Boston, Mass.—
498 Market St., San Francisco, Cal.—181 Morrison St., Portland, Ore. (1130-7122)

• 3000 •
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 Write For This
 Valuable Book**



\$187 Brings It
 THE "MIRNDALE"—This handsome E-Room Cottage can be erected in 7 to 8 days. Price and terms: \$187 down and \$30.00 per month. Total cost \$312.



\$414 Brings It
 THE "MIRACLE"—One of the most remarkable ever designed—Living Room and Dining Room—two large bedrooms—bath—modern—modern kitchen. Fine Porch, all complete. Can be erected in 12 to 14 days. \$414 down, balance, \$11.61 per month. Total cost \$691.



\$441 Brings It
 THE "MANOR"—Large, modern 2-room Home with bath. Can be erected in 18 to 20 days. Selling for \$441 down and \$12.25 a month. Our total price \$658.



\$628.00 Brings It
 THE "SENATOR"—8 commodious rooms, 2 closets, bath. Modern in every detail. Can be erected in 18 to 20 days. Sell for \$628.00 down and \$13.00 per month. Total price \$8,048.

GOING to build a home?
 Want to save big *money* and *time*!

Want a *home*, instead of mere "*house*"? Want one of the "Famous Fifty" chosen as perfect from thousands of master architects' home plans?

Then do as 3000 other alert home builders do daily—write for the "Famous Fifty" book, the sensation of the building world—the most remarkable of its kind ever published. *Absolutely free* to people who contemplate building.

Sterling System Built Homes

Two Years To Pay!

In addition to astonishingly low *prices* we offer most liberal *credit*. We ask but a reasonable cash payment and balance monthly—like rent. Our size and the quality of these homes allows us to do this. Buy your Sterling Home *now* instead of waiting. Simply let your rent money pay for your home.

Four Big Savings

(1) *Startlingly low prices*, because we own vast forests and mammoth mills and sell direct to consumer. Compare to what you would otherwise be forced to pay—at least 40% more!

(2) *Great labor savings*, because we measure and cut all lumber to fit by amazing power machines. Remember that carpenter cost in ordinary building is the largest item of expense. *We save you two-thirds of this!*

(3) *No cutting waste!* You waste approximately 18% when you buy lumber in bulk and saw it by hand.

(4) *Time saved!* You can be comfortably installed in your sterling Home by the time you would, by the old method, have the frame work sawed and erected.

Our price includes all *Lumber, Plaster, Hardware, Paint, Nails*,—everything from the ground up. Also complete plans, Blueprints, which anybody can readily understand. All materials best selected quality. *Money absolutely refunded if not exactly as represented.* Prompt shipment from our mills and shipping stations in Michigan, Florida, Texas and Washington.

NOW—The Book! Over 2000 of these valuable books mailed daily to home builders. Full of *New Ideas*. Full of *saving suggestions*. Full of wonderful homes, planned for comfort and economy by great architects. Send now. A postal or letter will bring book free by return mail.

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Please send me a
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Hammerless

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The Boy in you says, "Get the Book"

It's a pretty tame man that wouldn't enjoy reading and owning this 84-page Book. It tells what quality means in a revolver, what safety means, what accuracy and dependability mean. In other words it describes the Iver Johnson Safety Automatic Revolver.

The Iver Johnson "Champion" Single Barreled Shot Gun and our new Double Gun are shown and their many good features explained.

After reading the chapter on bicycles, you will understand why most racing men ride the Iver Johnson and why our bicycles have held front rank since



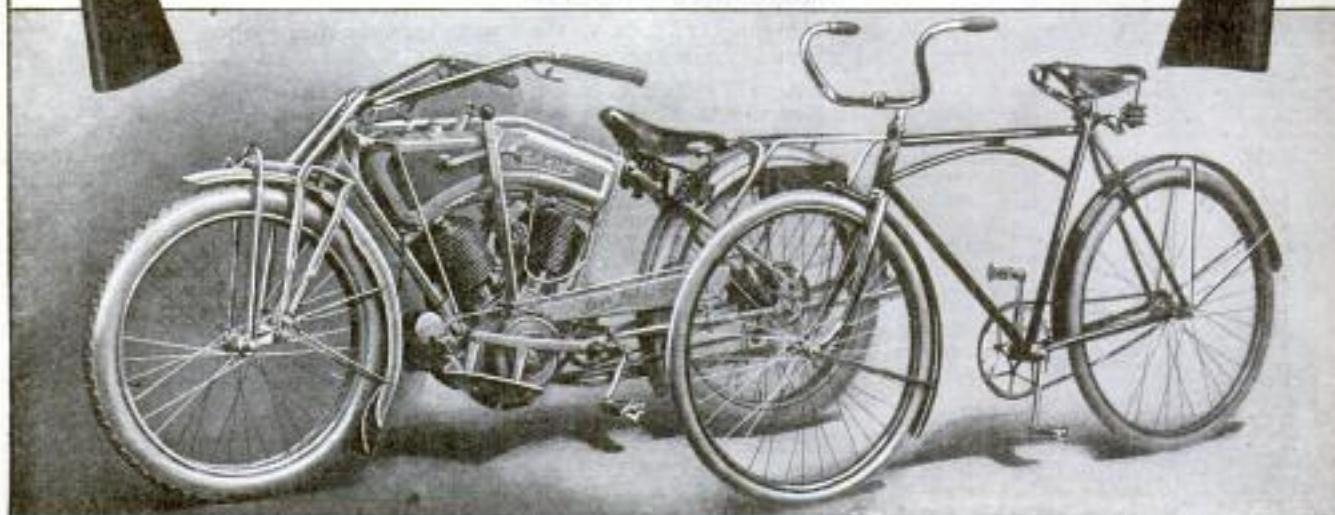
bicycles were invented.

You will be impressed with the talk on the Iver Johnson Motorcycle. It tells of a masterpiece of engineering. It is our belief that no better motorcycle will ever be built. Slight changes may be made, but basically the Iver Johnson Motorcycle is perfect.

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TYPEWRITER SENSATION

Free TRIAL—Use As You Pay

**Only \$3.00 a month until the low total price of \$48.30
is paid, and the machine is yours**

This is absolutely the most generous typewriter offer ever made. Do not rent a machine when you can pay \$3.00 a month and own one. Think of it—Buying a \$100.00 machine for \$48.30. Cash price, \$45.45. Never before has anything like this been attempted.

**Standard
Visible L. C. Smith**

Perfect machines, Standard size, Keyboard of Standard Universal arrangement writing 76 characters—universally used in teaching the touch system. (Keyboard writing 84 characters \$1.00 extra.) The entire line of writing completely visible at all times, has the tabulator, the two color ribbon with automatic reverse, the Back Spacer, in fact every late style feature and modern operating convenience. Comes to you with everything complete, tools, cover, operating book and instructions, ribbon, practise paper—nothing extra to buy. You cannot imagine the perfection of this beautiful typewriter until you have seen it. I will send it to you F. O. B. Chicago for five days' free trial. It will sell itself, but if you are not satisfied that this is the greatest typewriter you ever saw, you can return it at my expense. You won't want to return it after you try it—you cannot equal this wonderful value anywhere.

You Take No Risk—Put In Your Order Now

When the typewriter arrives deposit with the express agent \$9.30 and take the machine for five days' trial. If you are convinced that it is the best typewriter you ever saw, keep it and send me \$3.00 a month until our bargain price of \$48.30 is paid. If you don't want it, return it to the express agent, receive your \$9.30 and return the machine to me. I will pay the return express charges. This machine is guaranteed just as if you paid \$100.00 for it. It is standard. Over one hundred thousand people own and use these typewriters and think them the best ever manufactured.

The supply at this price is very limited, the price will probably be raised when my next advertisement appears, so don't delay. Fill in the coupon today—mail to me—the typewriter will be shipped promptly. There is no red tape. I employ no solicitors—no collectors—no chattel mortgage. It is simply understood that I retain title to the machine until the full \$48.30 is paid. You cannot lose. It is the greatest typewriter opportunity you will ever have. Do not send me one cent. Get the coupon in the mail today—sure.

HARRY A. SMITH, 231 N. Fifth Ave., CHICAGO

H. A. SMITH

231 N. Fifth Ave.
CHICAGO, ILL.

Ship me a No. 2 L. C. Smith F. O. B. Chicago, as described in this advertisement. I will pay you the \$30.00 balance of the SPECIAL \$48.30 purchase price, at the rate of \$3.00 per month. The title to remain in you until fully paid for. It is understood that I have five days in which to examine and try the typewriter. If I choose not to keep it I will carefully repack it and return it to the express agent. It is understood that you give the standard guarantee for one year.

Name

Address

Pop. Mech. May

**Be a
Manufacturer**



OF **HAYWOOD RETREADS**

MAKE \$3,000.00 A YEAR TO START

and more as you get accustomed to the business. Sounds like a whole lot of money, and it is—looks pretty big from where you stand if you are earning just an ordinary salary at an ordinary job, but why continue the job—why be on that side of the fence? Why not come over on this side—the manufacturing side—where the grass is greener and the picking is better?

It is not every business that will permit you to start with a very small investment. Most manufacturing business require big capitalization. And rich men take the profits while you, the producer, get a salary and the small end. But here is a business that gives **big returns, quick returns,** and the demand for your product is ahead of the supply and increases every day in the year. Start a Haywood Tire Repair Shop

MAKE \$250.00 A MONTH—\$3000.00 A YEAR

The certainty of success in this business is about as sure as anything in this world can be. **Automobile owners increase by the thousands each year and the tires are still the least durable part of the car.** Every owner tries to cut down his tire expense—every owner tries to repair his tires as long as they will hold together and this brings about

YOUR WONDERFUL OPPORTUNITY

You might just as well be the first to enter this paying business in your town—**open your shop and let the money roll in.** Every automobile sold means more tires to mend. You start with one machine. The business grows fast. You need another and then another. Soon it gets to be a regular business of adding machine—after machine until the first thing you know you are running a big shop—you are operating in a big way—you are a real business man and a factor in your community. **You know that punctures and blow-outs are common**—tires need retreading and vulcanizing every day—something going wrong all the time—owner after owner forced to buy new tires because they cannot get the old ones fixed.

If you are in the business, operate a tire repair plant as a side line in connection with your present business, garage or salesroom. Any place where there are many automobiles yields a big steady business besides the transient work. Experience is absolutely unnecessary. You can learn quickly. Anyone with a little mechanical turn or who can simply follow directions, can learn in a few days on old tires, to do the best work. Then business comes fast and easy.

REPAIR TIRES AT HOME

Young men make money to attend college or start a garage and repair business. Automobile owners—**repair your own tires.** Save money.

Pay for your outfit in a short time. We have special outfits for home use. Mr. Any-Man, it's worth while to investigate. There is money in it. It's a field of wonderful possibilities. Make up your mind and send for our catalogue **today.** Learn of the wonderful

money making possibilities in this fascinating new business. Make something—supply a want—become a manufacturer. This is your chance.

HAYWOOD TIRE & EQUIPMENT CO.
897 Capitol Ave.
Indianapolis, Ind.

Without any obligation upon my part please send me your complete FREE catalog of tire repair outfits.

Name.....

Address.....

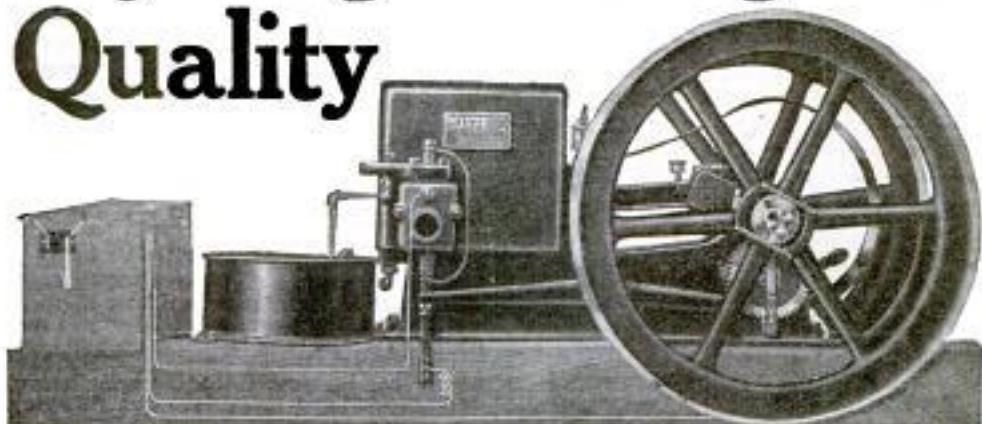


**THE
HAYWOOD
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CO.**

897 Capitol Ave.

INDIANAPOLIS, IND.

Lower Power Cost Proves My Higher Engine Quality



Latest WITTE Prices	
STATIONARY	
2 H.P.	\$34.95
4 H.P.	69.75
6 H.P.	97.75
8 H.P.	139.65
12 H.P.	197.00
16 H.P.	308.80
22 H.P.	389.65
PORTABLE	
2 H.P.	\$39.95
4 H.P.	82.75
6 H.P.	127.75
8 H.P.	174.65
12 H.P.	237.00
16 H.P.	358.80
22 H.P.	442.15
SAW-RIG	
6 H.P.	\$152.25
8 H.P.	202.15
12 H.P.	267.00

My engine H-P ratings have not been raised to make prices look low. My ratings are the same as in previous years—a liberal surplus of power in each size over the regular rating—while my prices are lower than ever.

A WITTE Engine of any size is guaranteed to give its full rated horse-power with a liberal surplus. So, probably, will any other strictly high-grade engine. But the mere ability to deliver its rated horse-power is not all that is needed to prove engine quality. The big question to consider is this: "How much will it cost in fuel, lubricant, and upkeep expense to get that rated horse-power out of an engine?" Real engine quality is measured by the engine's ability to keep that cost down to the lowest possible notch. And, other things being equal—strength, durability, simplicity, ease of operation, smoothness of running—the engine which keeps its operating cost down to the lowest notch is the engine for you to buy.

WITTE ENGINES

Kerosene, Distillate, Gasoline and Gas

Thirty years ago when gasoline and other like fuels were cheap almost any type of engine that could pull its rated load, regardless of amount of fuel used, would answer the user's purpose. Those early engines were mostly over-heavy and a large part of their own power was consumed in overcoming excessive friction of their over-heavy parts.

Today fuel IS a matter of first importance. I foresaw this years ago and began working toward a cheaper power cost. The result is the WITTE Engine of today which, measured by the cost of power put into the drive belt—its actual dollar-earning value—has set a new standard for engine efficiency. A saving of 25% of the fuel used by older type engines amounts, in a year, in many cases to more than enough to pay the entire first cost of a WITTE Engine.

Sent Direct From My Factory To User CASH OR EASY TERMS

Five Year Guarantee On Efficiency And Durability

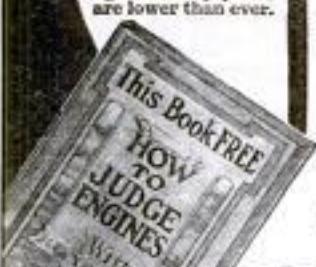
For 28 years the WITTE has maintained its lead in Engine Quality. But it has been hard to keep the cost of manufacturing down to the point where I could also lead in low prices. But I've done it. Compare my prices with others and see how much you save on the first cost of a WITTE—to say nothing of the steady saving on fuel and upkeep.

FREE ENGINE BOOK. Tells why I use semi-steel castings, instead of common grey iron; why I make cylinder and bed separable; vertical valves; four-ring pistons; automobile style ignition; safety spark shift for easy starting; and explains other features without which no engine is of high grade quality. Mail coupon today.

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1747 Oakland Avenue
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ED. H. WITTE, Witte Engine Works
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Without cost to me, and with no obligation on my part, I should like to receive your latest and finest Engine Book, and to investigate your New Liberal Selling Plan.



WITTE
Saw-Rig
Sizes: 6, 8 and
12 H.P. Kerosene
and Gasoline en-
gines furnished in this
style.

Name
Address

2c a Week Pays Wash Bill!

Electricity or Water-Power Does the Work

Write for
FREE Book

Just a "Twist of the Wrist" Starts or Stops the Machine!

The 1900 Motor Washers are now at work in thousands of homes. They are doing the work formerly done by women, at a cost of 2c a week for power! Saving thousands upon thousands of dollars in wash bills. Saving worlds of wash-day troubles. Leaving the women free to do other work while the machines are doing the washing.

The 1900 Motor Washer

Washes a Tubful in Six Minutes!

1900 Water Motor Washer
Can be connected with
any water tap instantly



1900 WASHER CO., 6183 Court St., BINGHAMTON, N. Y.

OR, IF YOU LIVE IN CANADA, WRITE TO THE CANADIAN WASHER CO., 386 YONGE ST., TORONTO, CANADA.

(23)

Handles Heavy Blankets or Dainty Laces

The outfit consists of the famous 1900 Washer with either Electric Motor or Water Motor. You turn on the power as easily as you turn on the light, and back and forth goes the tub, washing the clothes for dear life. Then, turn a lever, and the washer does the wringing. All so simple and easy that it is mere child's play.

A Self-Working Wringer Sent With Every Washer!

The motor runs Washer and Wringer. We guarantee the perfect working of both. No extra charge for Wringer, which is one of the finest made. Write for FREE BOOK and 30 Days' FREE TRIAL OFFER! Don't doubt! Don't say it can't be done. The free book proves that it can. But we do not ask you to take our word for it. We offer to send a 1900 Motor Washer on absolute Free Trial for an entire month to any responsible person. Not a cent of security—not a promise to buy. Just your word that you will give it a test. We even agree to pay the freight, and will take it back if it fails to do all we claim for it. A postal card with your name and address sent to us today will bring you the book free by return mail. All correspondence should be addressed to



Doing the wringing with
1900 Electric Motor Washer



CLASS PINS

FACTORY TO YOU

FOR COLLEGE, SCHOOL OR SOCIETY

Catalog with attractive prices mailed free upon request. Special offer, either style of pins here illustrated with any three letters and figures, one or two colors of enamel. STERLING SILVER, 30c each; \$3.00 dozen. SILVER PLATE, 15c each; \$1.50 dozen.

BASTIAN BROS. CO., 631 BASTIAN BLDG., ROCHESTER, N. Y.



NO. 2479

A FLAT LONG-SPAN CONCRETE ARCH—A very flat concrete arch of long span was built during 1914 over the Aare River at Olten, Switzerland. Its span is 269 ft. and its rise 30.4 ft., giving a ratio of span to rise of 8.8. The bridge is relatively narrow, being only 26 ft. wide between railings. The 16-ft. roadway is designed for a safe load of 77 lb. per square foot, while the sidewalks are figured for 110 lb. per square foot. Load tests under a 16-ton steam roller gave deflections of $\frac{1}{8}$ inch.

\$3000 FOR YOU

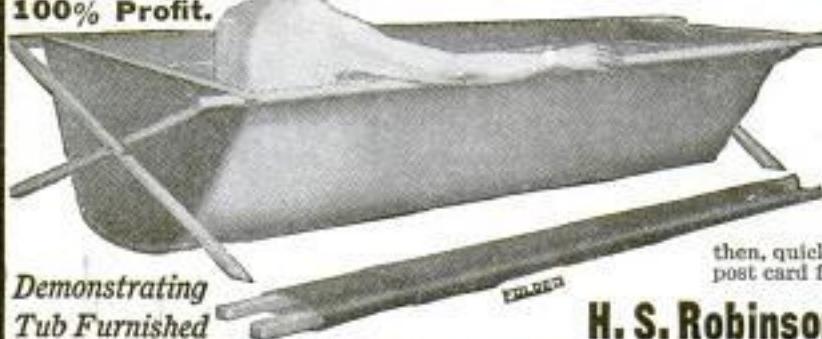
That's the money you should get this year. I mean it. I want County Sales Managers quick, men or women who believe in the square deal, who will go into partnership with me. No experience needed. My folding Bath Tub has taken the country by storm. Solves the bathing problem. No plumbing, no water works required. Full length bath in any room. Folds in small roll, handy as an umbrella. I tell you it's great! GREAT! Rivals \$100 bath room. Now listen! I want YOU to handle your county. I'll furnish demonstrating tub on liberal plan. I'm positive—absolutely certain—you can get bigger money in a week with me than you ever made in a month before. I KNOW IT!

TWO SALES A DAY—\$300.00 A MONTH

That's what you should get—every month. Needed in every home, badly wanted, eagerly bought. Modern bathing facilities for all the people. Take the orders right and left. Quick sales, immense profits. Look at these men—Smith, Ohio, got 18 orders first week; Meyers, Wis., \$250 profit first month; Newton, California, \$60 in three days. You should do as well. TWO SALES A DAY MEANS \$300 A MONTH. The work is very easy, pleasant, permanent, fascinating. It means a business of your own.

Little capital needed. I grant credit—Help you out—Back you up—Don't doubt—Don't hesitate—Don't hold back—You cannot lose. My other men are building houses, bank accounts, so can you. Act then, quick, SEND NO MONEY. Just name on penny post card for free tub offer. Hustle!

Exclusive
Territory.
100% Profit.



Demonstrating
Tub Furnished

H. S. Robinson, Pres.

787 Factories Bldg., TOLEDO, OHIO
Canadian Branch—Walkerville, Ont.

Tobacco Habit **BANISHED**

in 48 to 72 Hours

No Desire After First Dose

Trying to quit the tobacco habit unaided is a losing fight against heavy odds, and means a serious shock to your nervous system. So don't try it! Make the tobacco habit quit you. It will quit you if you will just take Tobacco Redeemer according to directions.

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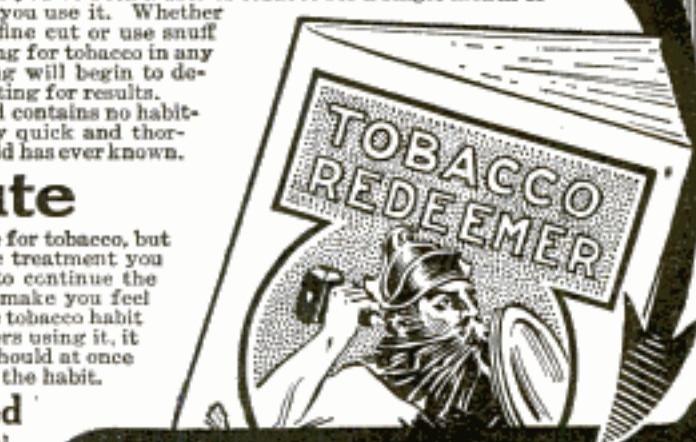
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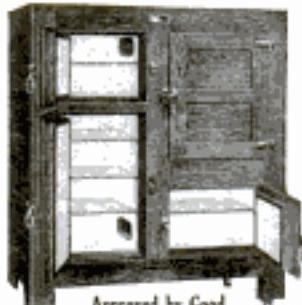
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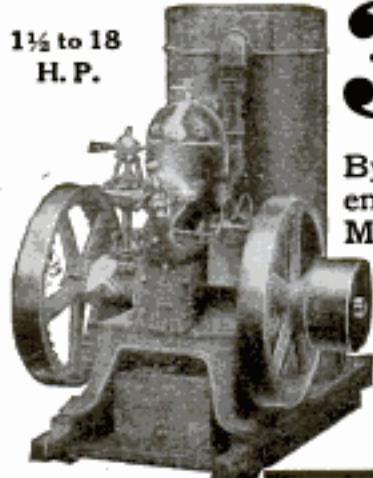
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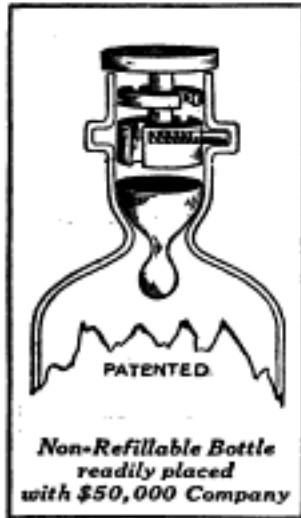
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purchase of a patent on a device for holding an electric light in any position. Besides these there are hundreds of manufacturers who do not specify any particular device but state that they would be interested in anything of merit

A Chicago man says: "I want something that can be sold to farmers by mail. There is practically no limit to the investment my associates would make in a good proposition." A man in Woodhaven, N.Y., says he is in the market for a small household article, light in weight, which can be sold somewhere around ten cents.

A prominent manufacturing company is interested in something to sell to hardware stores, but would also be interested in other things promising to be money-makers.

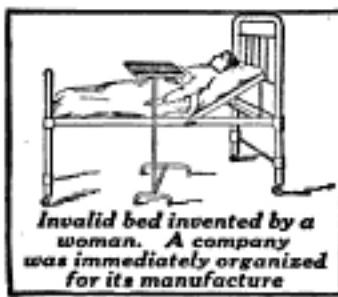
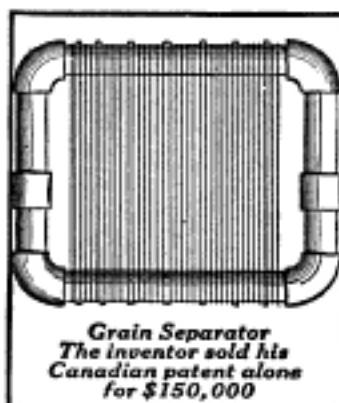
A man in Revere, Mass., says: "I am looking for something that can be manufactured, plant equipped, etc., and marketed for an outlay of not over twenty-five thousand dollars."

A big textile machinery company says they are interested in newly patented devices that can be either bought outright or manufactured on royalty. They do not require machinery inventions alone, but anything of merit.

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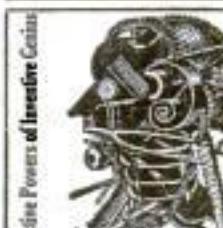
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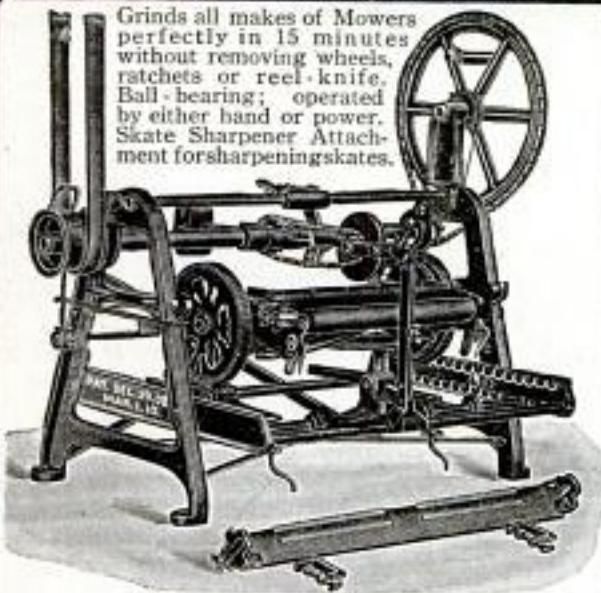
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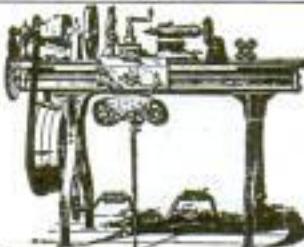




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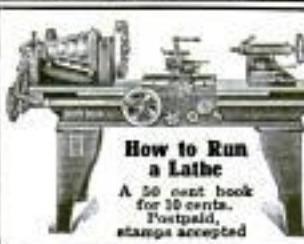


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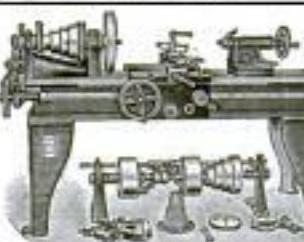
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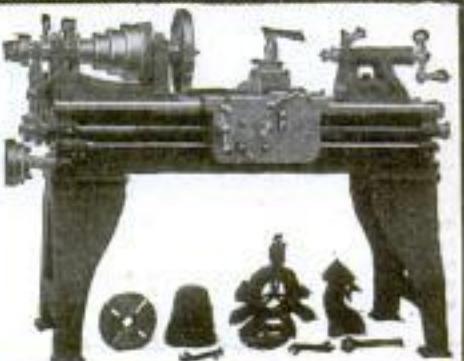
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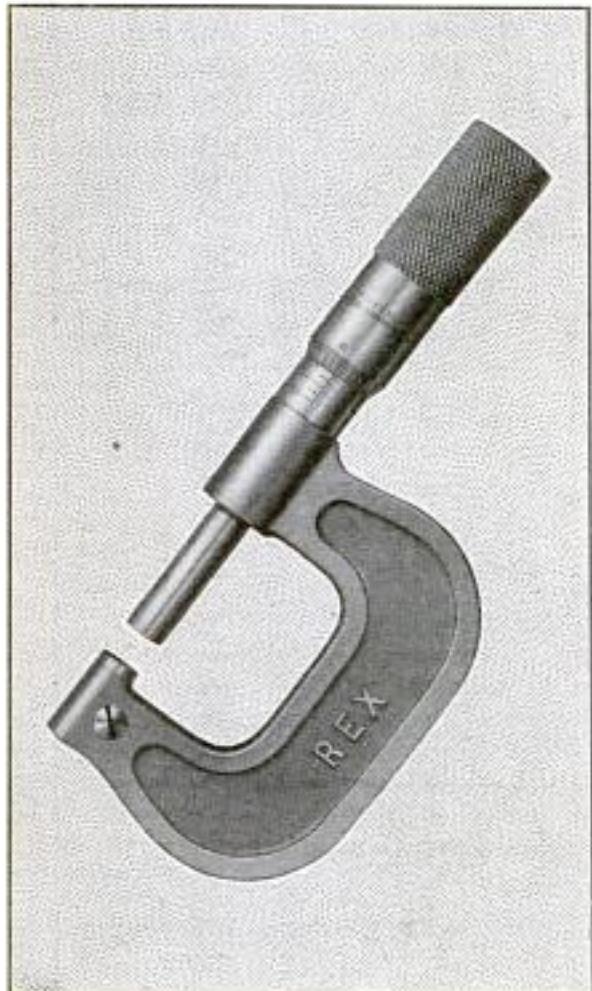
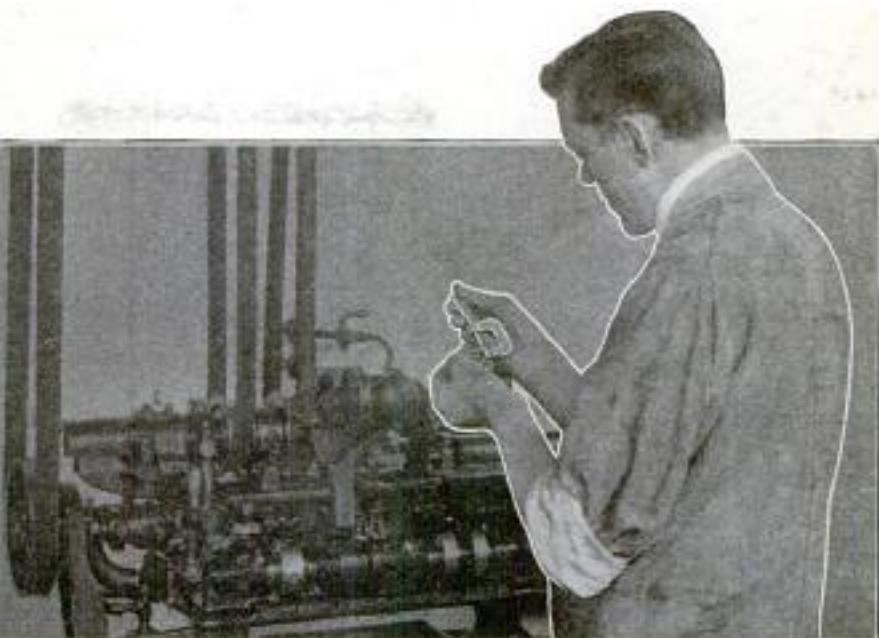
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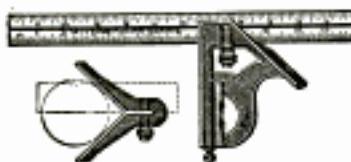


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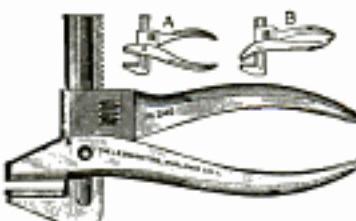
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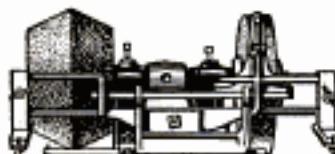
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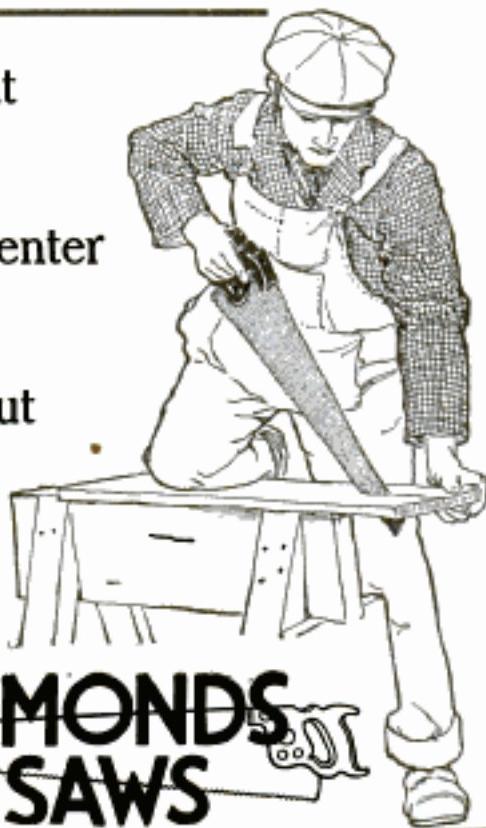
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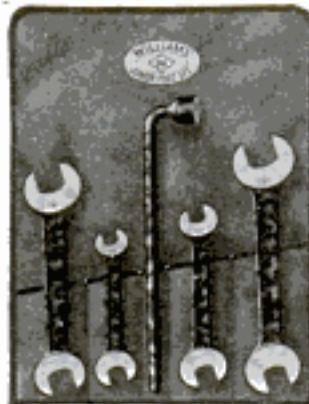
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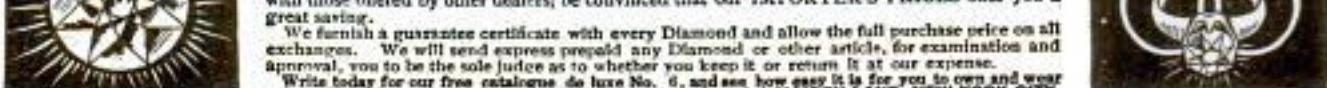
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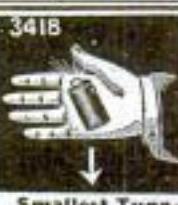
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Send 20c today for Booklet, telling how to build this automobile. Complete instructions and descriptions of parts and sizes, illustrated with diagrams, blue print, cuts made from photographs, and price list of parts.

SPECIAL INDUCEMENT to first boy in your town
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Easy motorcycle saddle—New coaster brake—motorcycle mud guards, stand and parcel rack—motorcycle pedals—long rubber grip—motorcycle handle bars—re-inforced motorcycle frame. Flat Tread Clincher Tires—beautiful finish. Write

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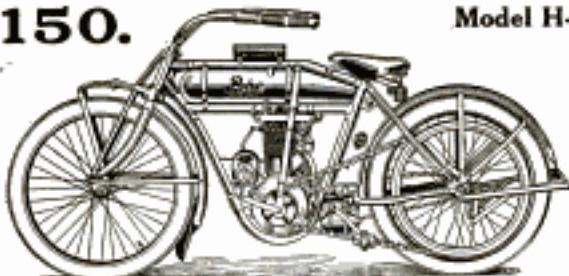
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\$150.

Model H-15



Pope Motor Cycle

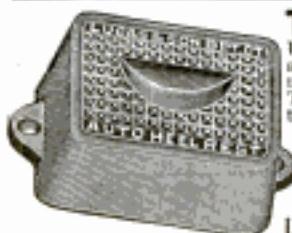
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The only practical, dependable, fully equipped motorcycle sold at so low a price. A highly efficient machine that does more than you expect.

Now in its fifth year, and a great success from the start. Every feature thoroughly tested and proved. Over one hundred less working parts than any other machine of its class—ample road clearance—spring cushion seat post—easy riding—easy control—a wonderful hill climber—lowest operating expense. The product of 37 years' successful experience in making the best. The Pope trade mark is the world's guarantee for quality.

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Used on all cars for the Brake, Clutch and Foot Accelerator Pedals. It brings the foot to just the right height. Takes that strain off the ankle. Saves the floor mat. Locates the heel.

Four Sizes 14 in., 15 in., 15½ in., 2 in.
Polished Aluminum

PRICE EACH 75c
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\$40 Motorcycle

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the weight of the rider furnishes the power. No work. Lots of fun. Healthy. This little wonder is ball bearing and made on the best bicycle standards. Sold at a popular price. Suitable for boys and girls 5 to 15 years old. Write for free circular.

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New Price Reduction on Goodyear Motorcycle Tires!

We are glad to announce a big 15 per cent reduction on Goodyear 3-inch Motorcycle Tires.

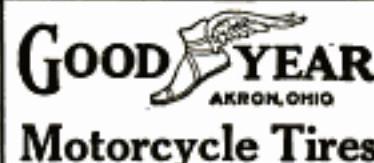
Goodyear policy on price is to give the utmost in a tire at the lowest possible profit. Our reduction is made to that end, without ever reducing the quality.

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Goodyear Motorcycle Tires offer the best we know. They are built to give you the lowest cost per mile. They minimize tire trouble in seven costly ways, employed by no other maker. And they are always the same, regardless of price reductions.

No reason now, with this new lower cost, why you, too, can't ride on these Goodyear tires.



Note These Features

Goodyears last year won all notable records for speed and endurance. Riders saw these tires were best and they bought them almost 3 to 1. Yet this season, in spite of price reduction, we have added these seven new features. They cost us \$50,000.00 extra.

Mileage Increased: (1) by giving a heavier, tougher tread.

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The Goodyear Tire & Rubber Co.
Akron, Ohio

Makers of Goodyear Automobile Tires

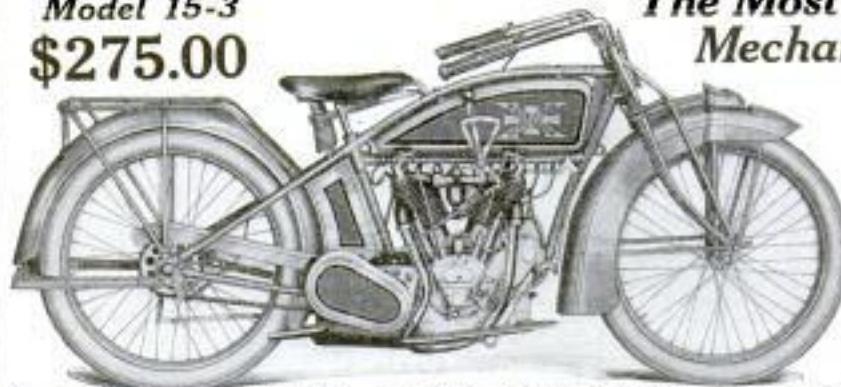


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Every up-to-the-minute detail, including Three Speeds; Motor Starter; Mechanical Lubrication; Double Brakes; Non-Splash Fenders; Folding Foot Rests; Luggage Carrier; Excelsior Kum-

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Buy your Motorcycle accessories from the largest supply house in the United States.

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Piercing the Khojak Range between Quetta and Chaman, near the northwestern frontier, is a 12,870-ft. tunnel, which is the longest in India. Another tunnel, 3,900 ft. long, which is now being driven on a double track cut-off between Thana and Diva, will be the next longest. This pierces the Parsik Hill and reduces the distance between these points 1½ miles.



5 H.P. 1915 Peerless Motorcycle

with Free Engine, Bosch Magneto, together with the best there is in Motorcycle construction. Power, Speed, Silence, Endurance, and those wearing qualities so essential for low cost of maintenance.

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at a small cost, by using our attachable outfit. Fits any Bicycle. Easily attached. No special tools required.

8 Months' Repairs, 30c

Jr. Grahams, of Texas, writes: "I want to write a few lines to you telling you how well pleased I am. Any man or boy can make a good motorcycle with that little 2½ H. P. SHAW motor. It is the simplest and best motor a man can buy for a little money. I ran mine eight months without repairs, and then it was only 30 cents. It uses only half the fuel that other machines use. I can go anywhere with the little SHAW that any other can."

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A Vitalic Bicycle Tire wears well because the tread is so tough that only the wearing down of long service affects it; because the motorcycle tire fabric cannot split; because the inner tube is heavy, pure rubber of the finest quality.

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Troll With This Motor Without Altering Its Speed

It has five mechanical speed adjustments—a high speed, ideal trolling speed, neutral, slow and fast reverse. Speed adjustments are secured by simply pressing a button without stopping or altering the speed of the motor. When the



Push-Button Controlled

is set at neutral, the boat stands still while the motor remains running. It has a high-tension, waterproof

Magneto Enclosed in Flywheel

giving a good, hot spark down to practically the last revolution. Motor can be furnished with dual ignition if desired.

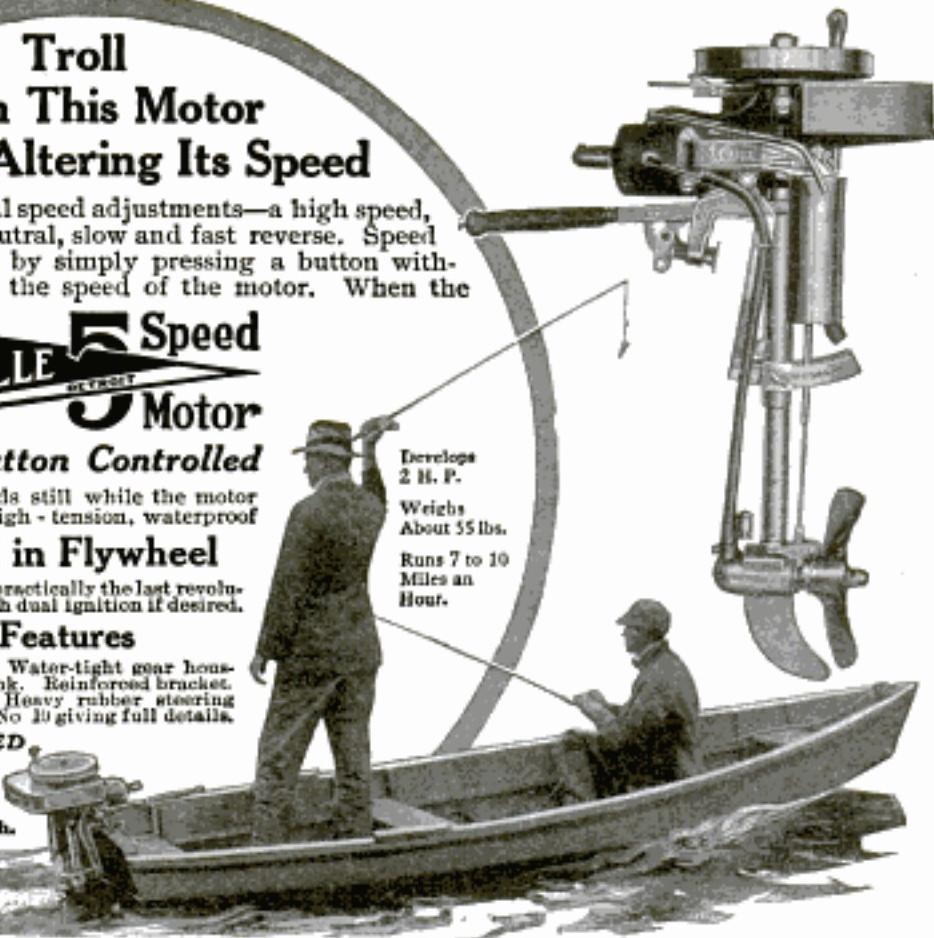
Other Caille Features

Caille Silencer with cut-out. Water-tight gear housing. Double-seamed fuel tank. Reinforced bracket. Non-kinking water tube. Heavy rubber steering handle. Send for catalog No. 10 giving full details.

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Marine
Motors from
2 to 30 H.P.
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Unmatched Speed No Vibration

Speed that runs away from all other rowboat motors. Double the power—no vibration. It does not shake

2-Cylinder the boat. KOBAN ROWBOAT MOTOR

Last season's record proved its mettle. Absolutely dependable—easy to start—reverses by pressing button.

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The Koban has 2 opposed cylinders—that's what removes vibration—3 H. P.—nearly double that of other motor-speed propeller. Best constructed rowboat motor on the market. Write for 1915 catalog. Active Agents Wanted.

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4 Cycle, 4 Cylinder, 12 to 20 H.P. Highest quality. Silent operation. No vibration. Controls like the finest Motor Car engine. Extremely economical on fuel. Used as standard equipment by over 80 per cent. of the world's leading boat builders. Catalog on request, \$1.00 to \$500 depending on equipment.

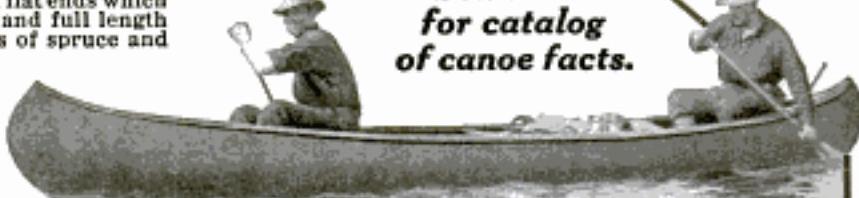
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A strictly HIGH GRADE Motor that will give CONSTANT and EFFICIENT service. Especially adapted for CANOES and LIGHT BOATS. Aluminum base, copper water jacket, steel shaft, bronze bearings.

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 Attach one of the speedy Little Wisconsin Juniors to a canoe or row boat—skim through the water. Sales come easy. Every boat owner that sees it in action is interested at once. It's the only motor with the self-locking tiller—a twist of the wrist holds the boat in any course you set. The Wisconsin patented adjustment at top of motor is another exclusive and sales winning feature.

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Wisconsin Machinery & Mfg. Co.
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 Makers of marine motors for 14 years
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MONEY BACK ABSOLUTELY if you don't think it's worth more than you paid for it. Write today and get one of these \$1.00-\$1.50 size bait at special price.

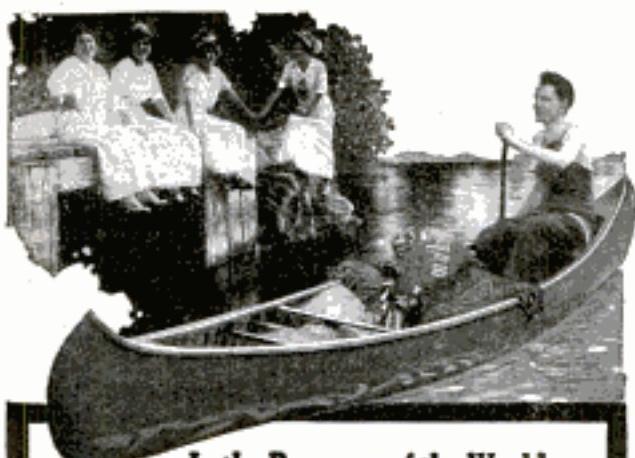
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5 to 27 h.p.
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Gasoline or Kerosene
Speed, regular, or heavy duty.
Strong, simple,
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Built for a lifetime.
The boat-builder's
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Non-backfiring. Heavy
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3 H.P. 1 cyl. complete	\$ 65.00
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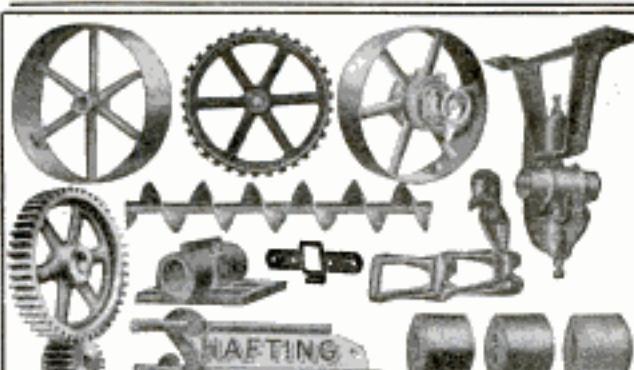
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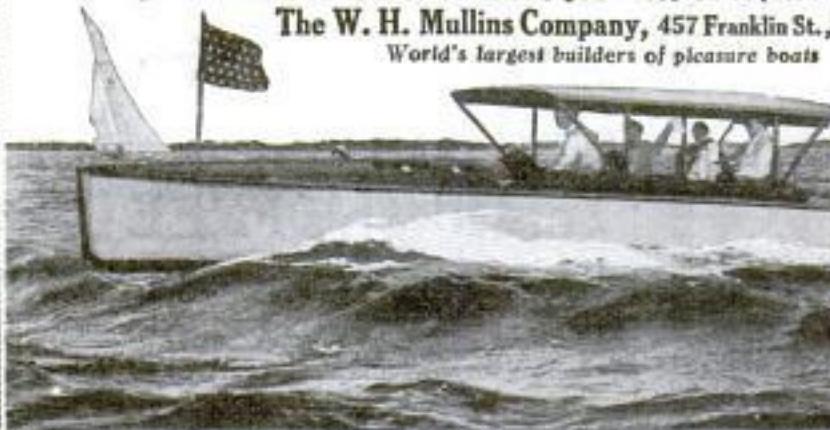


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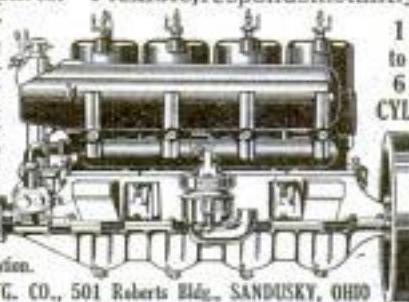


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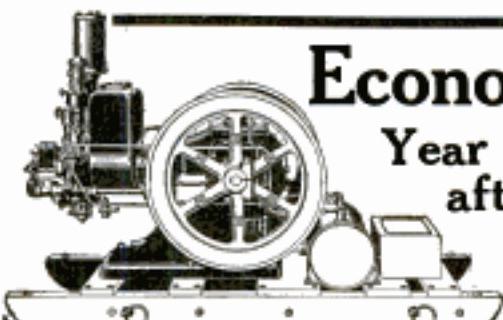
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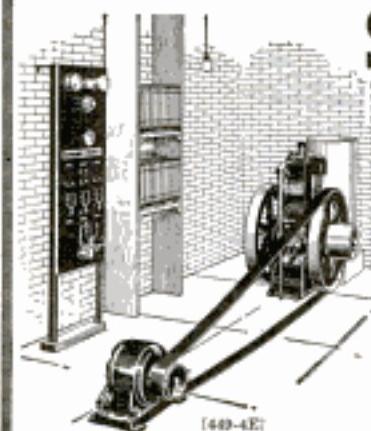
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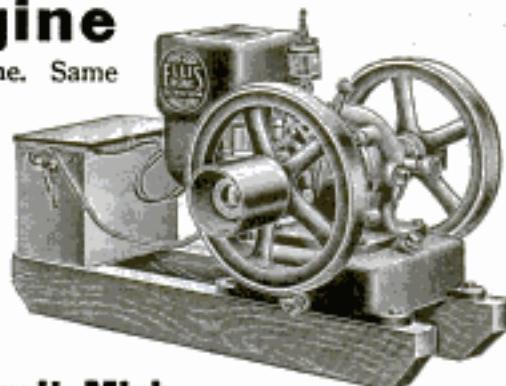
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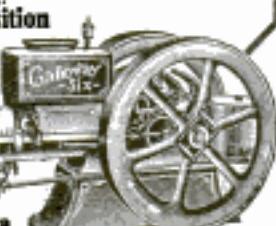
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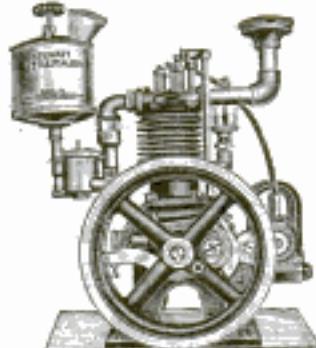
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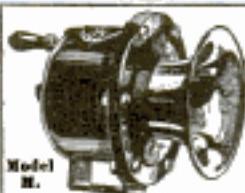
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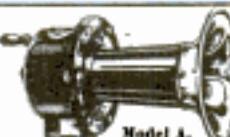
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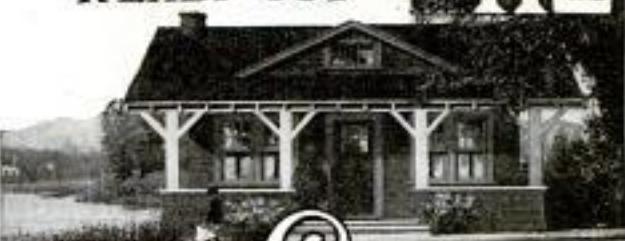
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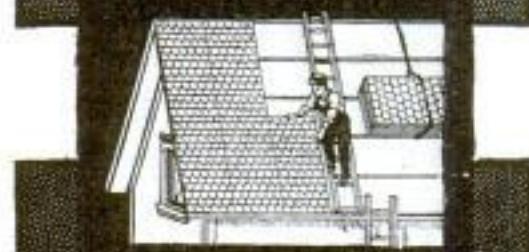
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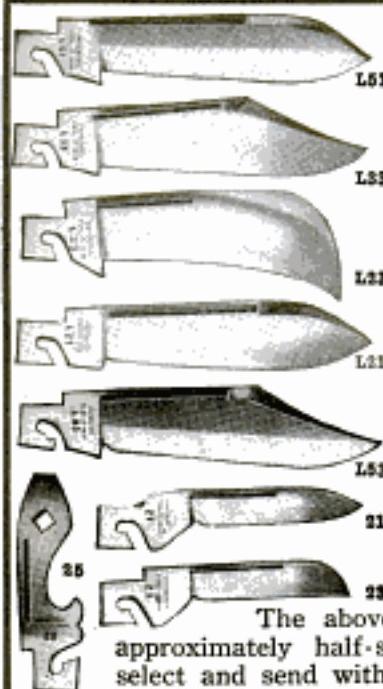
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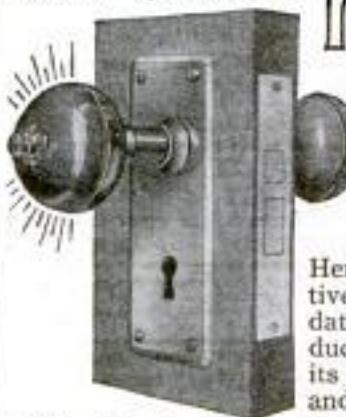
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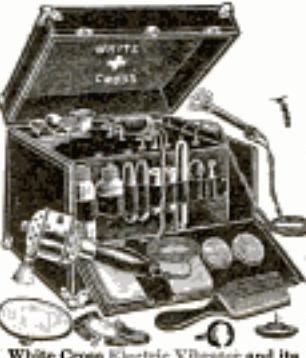
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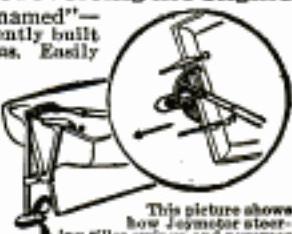
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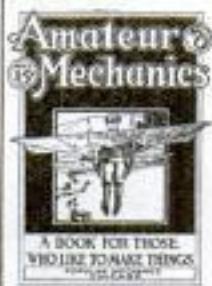
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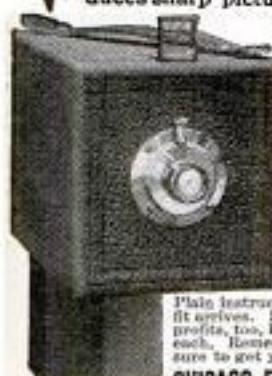
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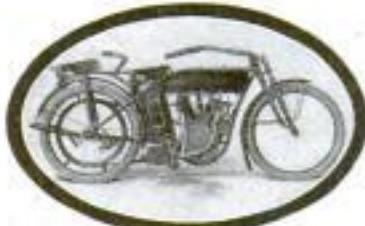
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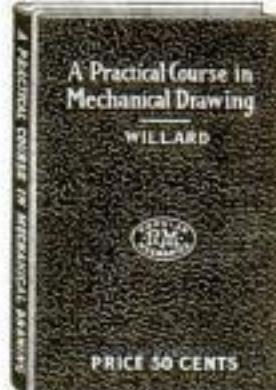
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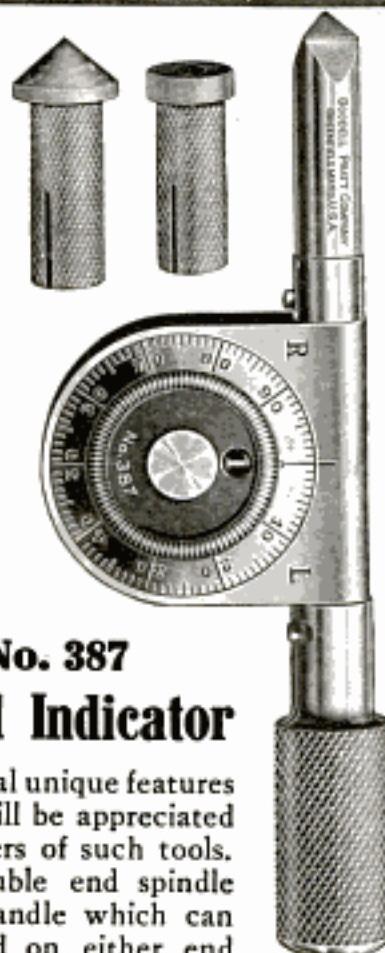
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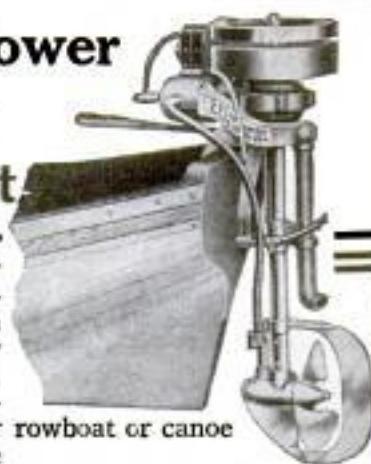
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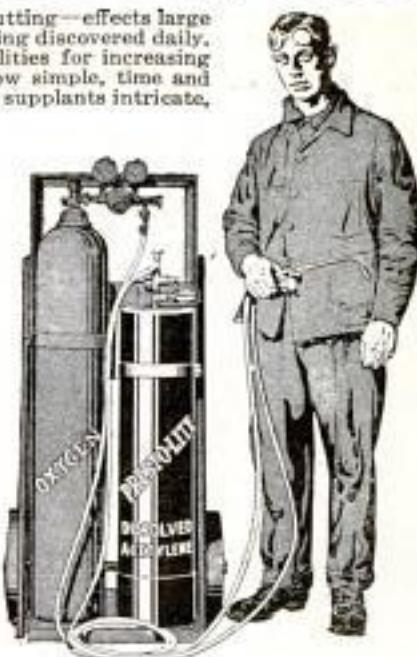
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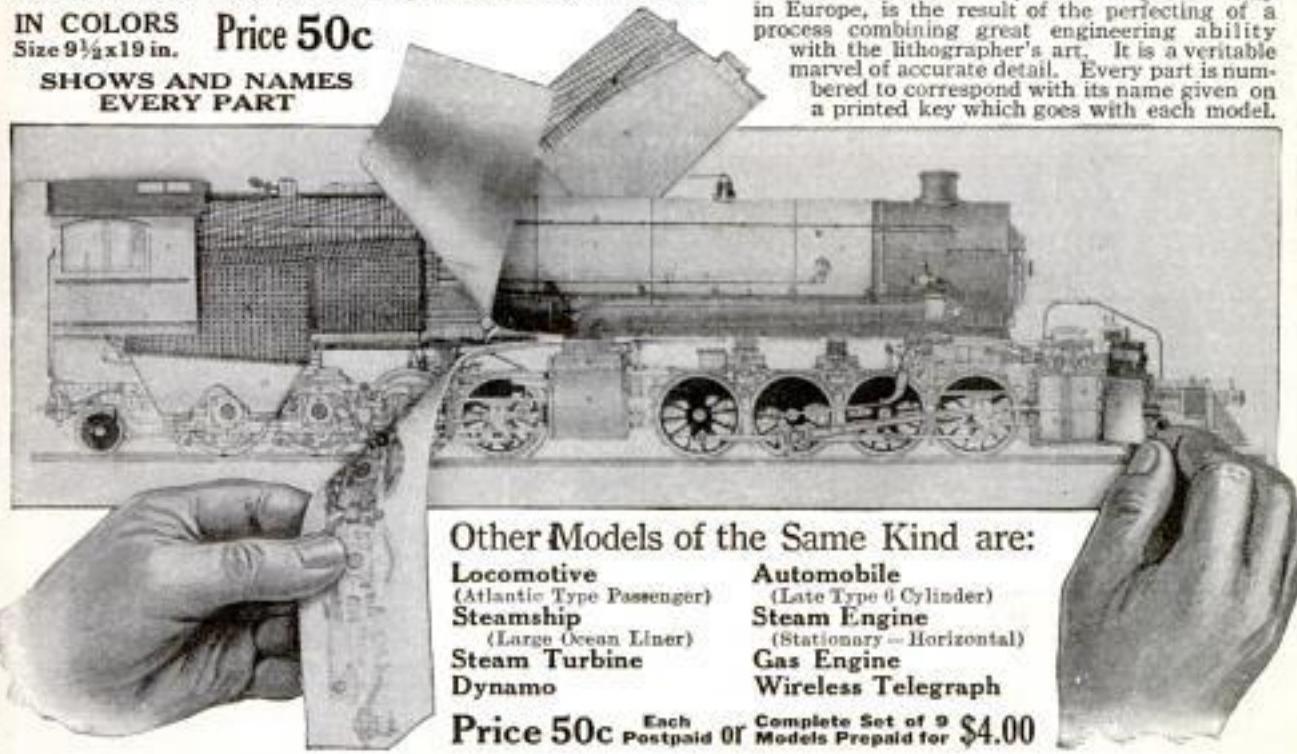


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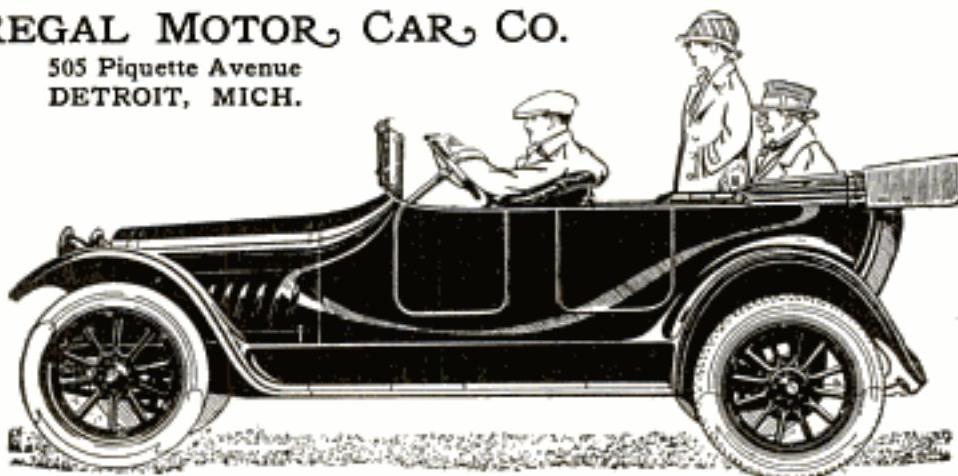
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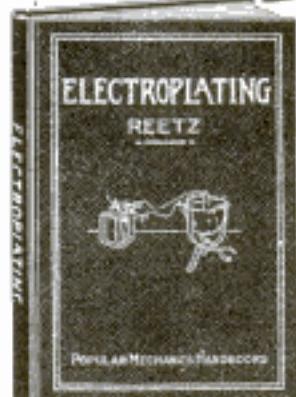
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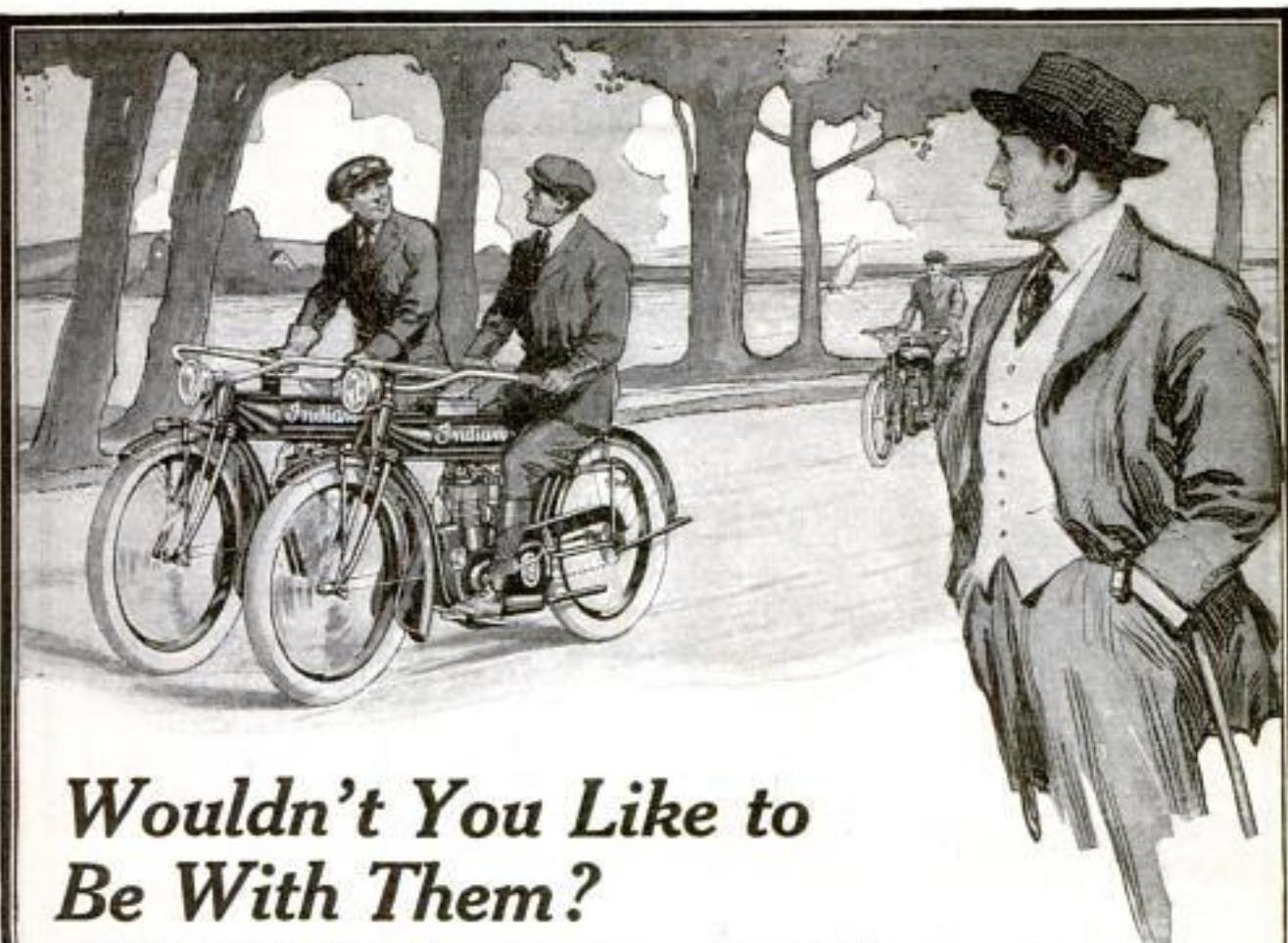
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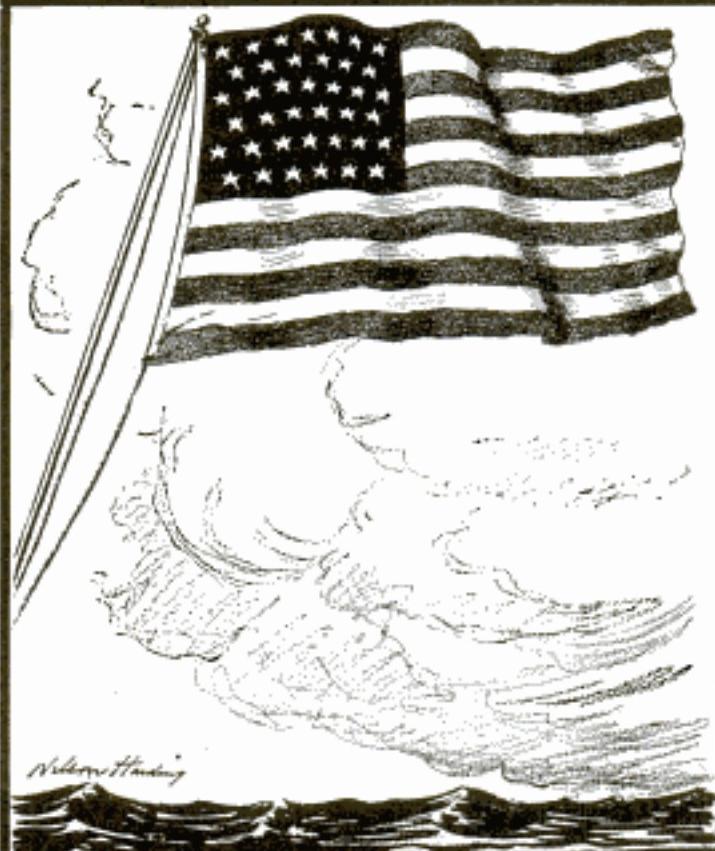
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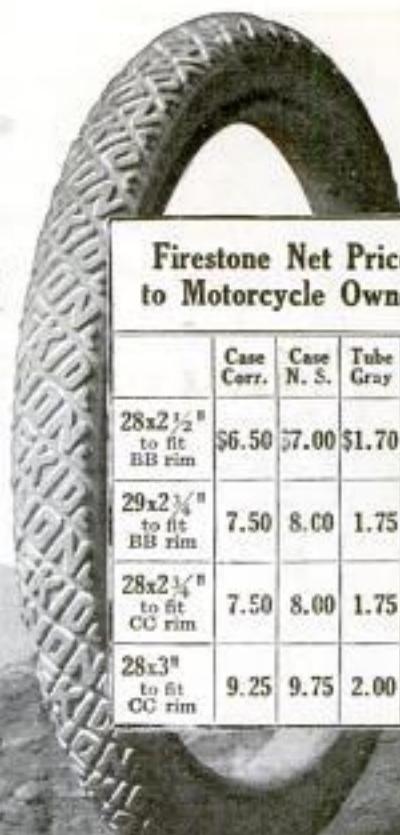
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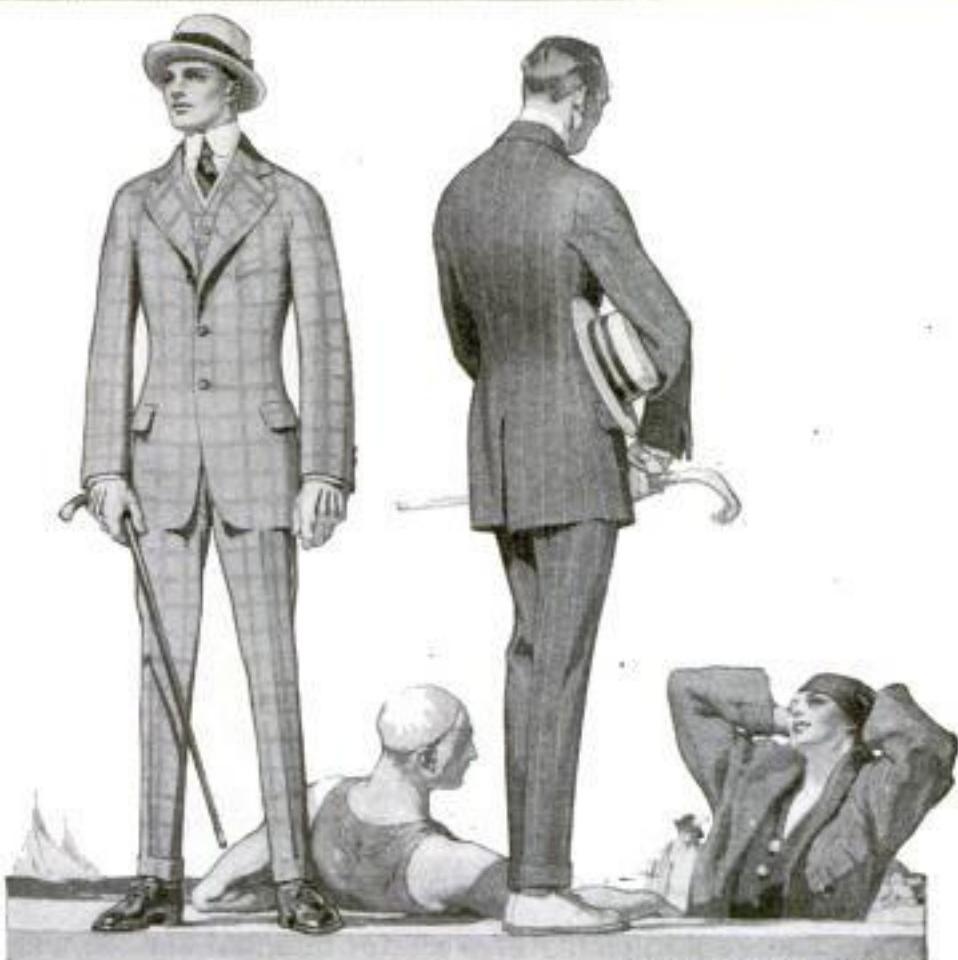
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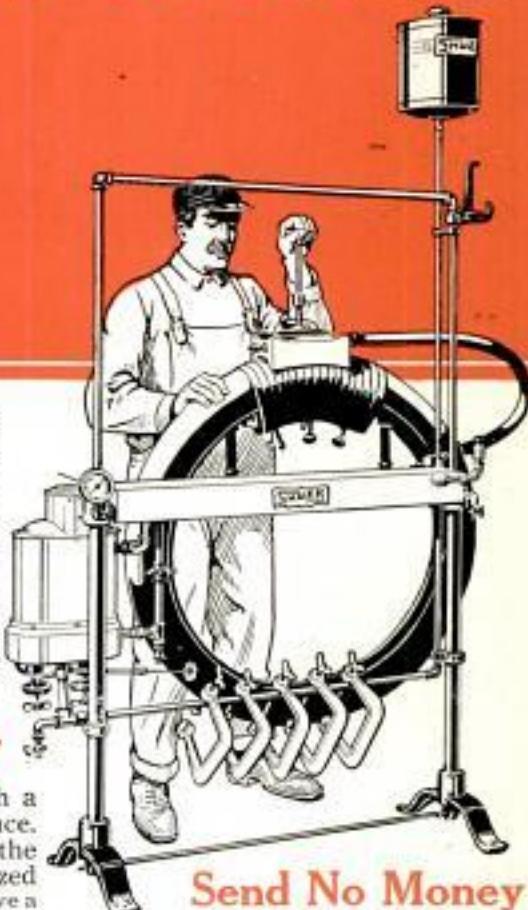
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